The Electrical Industry's Weekly Magazine

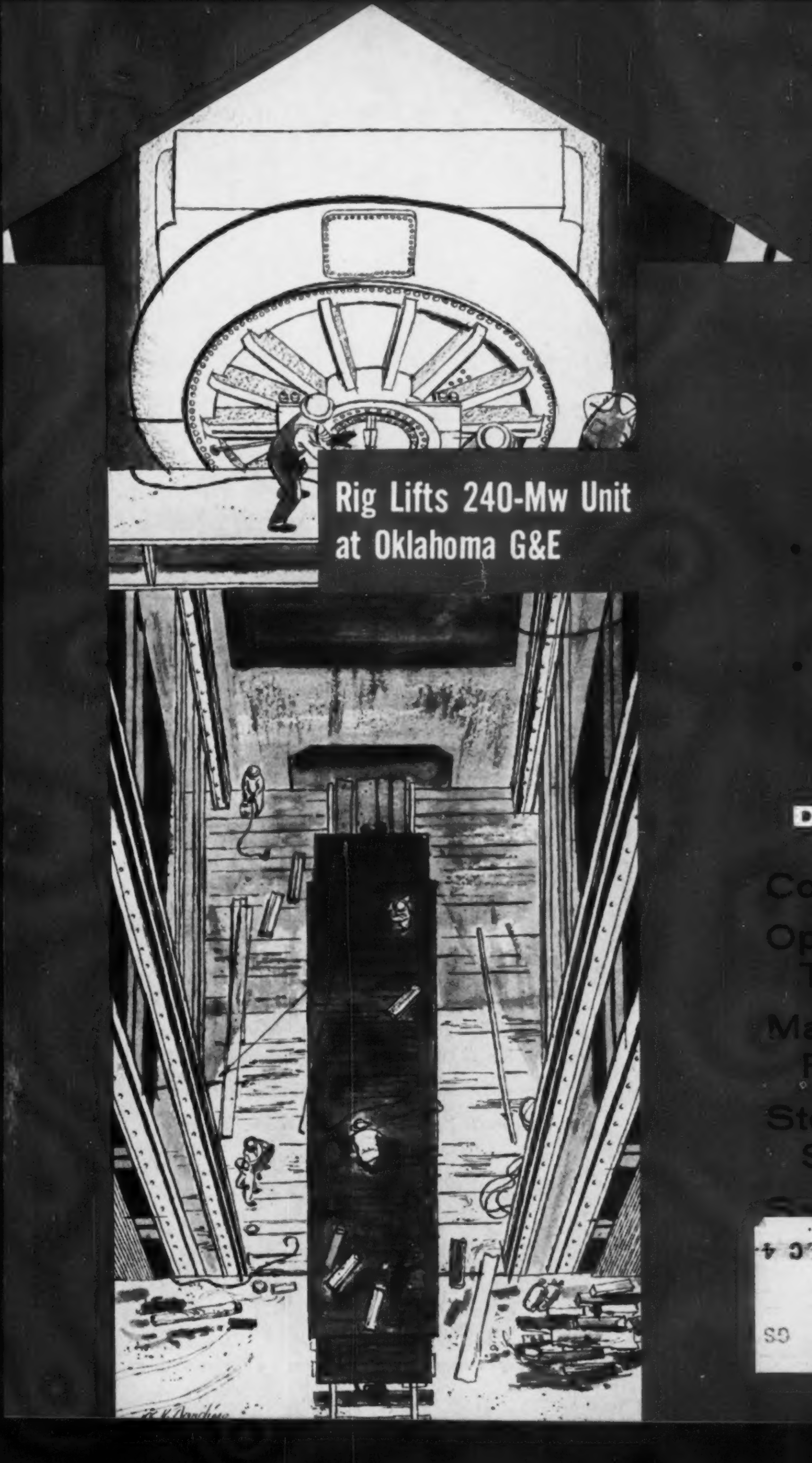
April 25, 1960

Electrical World

Price One Dollar

A McGraw-Hill Publication

Second of six reports for 1960



Rig Lifts 240-Mw Unit at Oklahoma G&E

Starts on p 91

- Oscillograph shows LTC operating sequence at Baltimore G&E
- Special boom handles conductor repair on 405-ft tower for Mississippi P&L

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Safety

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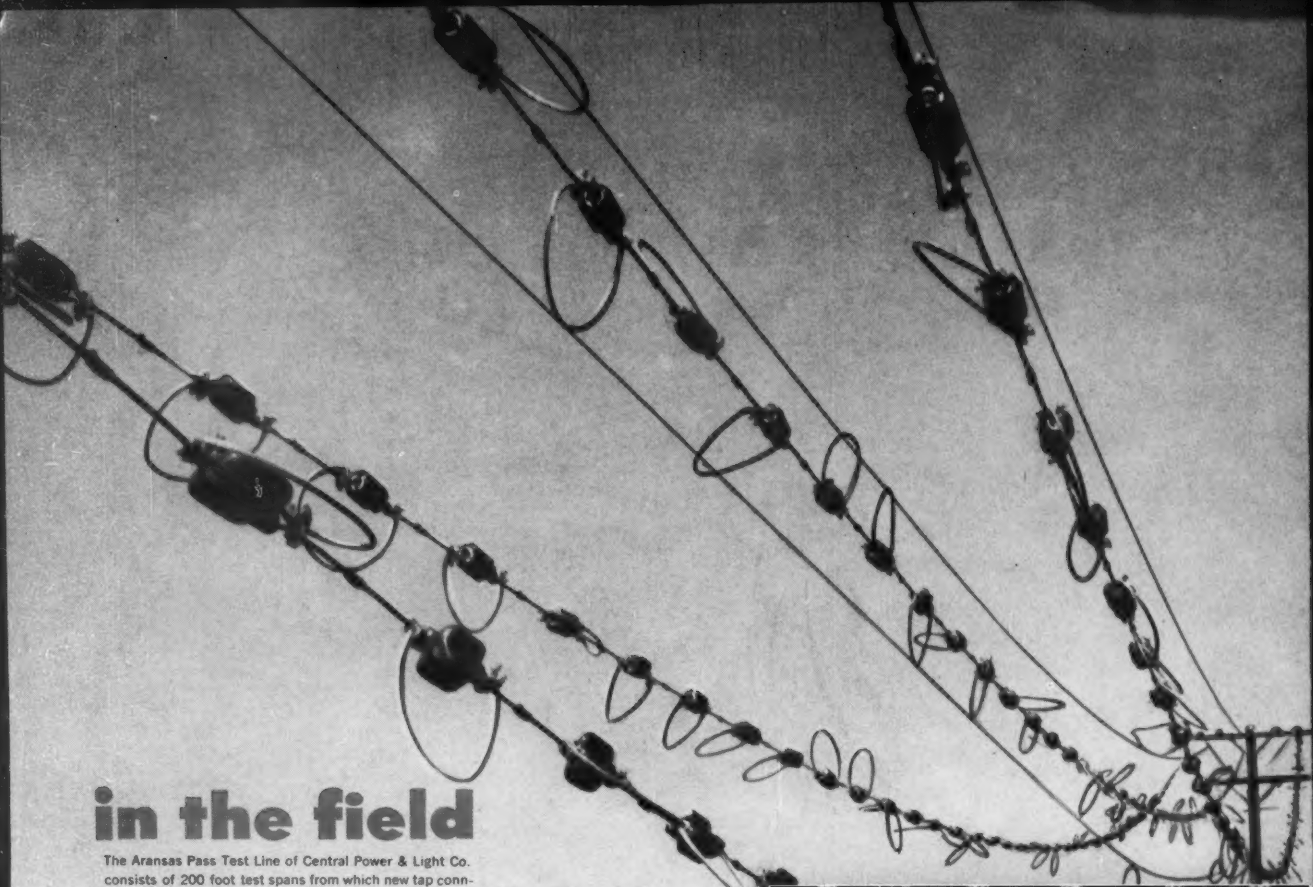
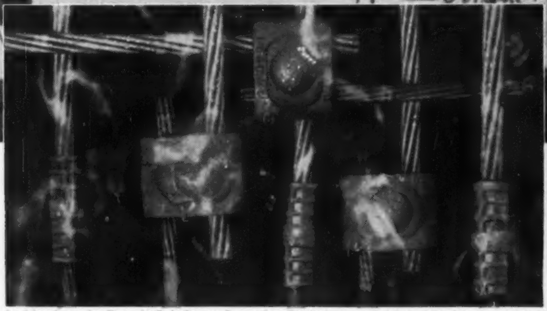


in the field

The Aransas Pass Test Line of Central Power & Light Co. consists of 200 foot test spans from which new tap connections are made periodically on weathered run conductor and current cycled.

. . . and in the lab ▸



Inside view of a Burndy Salt Spray Corrosion Test shows what happens to connectors and cables of dissimilar metals when exposed to severe atmospheric conditions.

BURNDY RESEARCH

CONCENTRATES ON THE DEVELOPMENT OF BETTER ELECTRICAL CONNECTIONS

Burndy's field research with Central Power & Light on weathered overhead lines is expected to provide valuable information on connector installation practices, and possible data for the future design of connectors and cables with longer and more predictable life spans.

Burndy's research has produced: Massive Aluminum Tap—TAPIT®; Single Sleeve ACSR Splice—UNISPLICE$^{T.M.}$; Pre-insulated Service Entrance Splice—INSULINK®. Burndy research will continue to concentrate on the development of better electrical connections.

BURNDY

58-18

NORWALK, CONNECT. • BICC—BURNDY Ltd., Lancs., England • In Continental Europe: Antwerp, Belgium • TORONTO, CANADA

Electrical World

Published for 86 years
for those engaged in
the business of generating,
transmitting, distributing,
or applying electric power

Vol. 153, No. 17

APRIL 25, 1960

In This Week's Issue

CURRENT EVENTS

California PUC Rules on Depreciation
Only taxes paid are chargeable as operating expense; two commissioners have dissenting opinions. . . . . p 65

Upper Colorado Argued Before Committee
Investor-owned utilities and preference customer group present conflicting views on power market of CRSP complex . p 66

MEETING

Rally to Profit System, APC Told
Taxation, congressional investigations, regulation beget new immortality, Chicago meeting is warned by J. R. Conrad . p 69

Special Report

p 91

Electric Utility Methods

Ingenuity and innovation are the hallmarks of new tools, devices and practices presented in the second of six reports in 1960 for those engaged in utility construction, operation or maintenance. More than 20 proven methods are covered in this 70-page report.

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AFTER 30 YEARS ON THE JOB . . . Okolite insulation still looks good. This unretouched photograph shows a section of 11.5 Kv power cable recently re-assigned by Duquesne Light Company. Note that the insulation is still flexible and resilient—workable. Tests made this year show the tensile strength has deteriorated very little, remaining more than 33% above the original specification figure.

30-year-old Okonite cable still tests above specification figures . . .

This is CABLE'BILITY *a new word for your vocabulary*

> **Cable'bility** (cā'ble·bil'·i·ty) *new word. Noun.* **1.** Ability to design and manufacture electrical cables that give outstanding performance. **2.** Having long background and wide experience in cable research and application. **3.** Possessing keen understanding of customers' problems. Implies eagerness to serve faithfully and dedication to progress. **Syn.** The Okonite Company.

This is Okonite Cable'bility at work. It's "Old Faithful"—a 1250 MCM, Okolite-insulated power cable made in 1929, now carrying on a new career as a mine power feeder for Duquesne Light of Pittsburgh.

"Old Faithful" began service as an 11.5 Kv lead from switchyard to transformer, handling 15,000 KVA loads. During World War II, it saw fifteen years of full load operation, 24 hours a day. Then in 1957 it was replaced with a larger cable to handle even greater loads. But it was found still suitable for demanding tasks as a power feeder.

There are Okonite "Old Faithfuls" in use today in every application . . . *yours* too. Because, as in 1929, Okonite still produces the most dependable cables on the market. The reason is Cable'bility. The Okonite Company, Subsidiary of Kennecott Copper Corporation, Passaic, N. J.

where there's electrical power . . . there's **OKONITE CABLE**

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LETTERS

Niagara Was No Side-Wheeler

To the Editor:

In reference to your article, "Old Ferry Begins Construction Career," (EW, March 14, p 72), please, let's not make the ferry boat Niagara any older than she actually is.

Niagara never had a walking beam or the implied side wheels.

She had a propeller at each end, driven by twin compound reciprocating engines—boiler pressure about 200 lb: practically a standard for steam ferries since the 1890's.

Your caption writer undoubtedly has nostalgic memories of his remote youth.

James T. Wilson, President
The Steamship Historical Society of America, Inc
Staten Island 10, N.Y.

An Assist for Heating Conference

To the Editor:

The First National Electric House Heating Convention held in Chicago in March was a phenomenal success. One of the diligent workers who helped... was Roger Weiler of Sun-Tron Corp.

It should be of interest to you and your readers to know that Roger, as of the first of the year, was promoted within his company and moved out of its electric heating division, but his company was kind enough to let Roger continue with his NEMA activities until after the conference.

Stanley B. Aronson
Berko Electric Mfg Corp
Queens Village 28, N. Y.

Why Call It "Demand?"

To the Editor:

Is the industry again making the mistake of seeking a word that we in the business understand but which those outside will not?

"Reservation" was my choice and I have submitted this. There are few adults who are not aware of the generally accepted meaning of this word as regards night clubs, hotels, motels, etc.

Jerry Lounsberry
Gulf Power Co
Ft. Walton Beach, Fla.

To the Editor:

. . . It was from the viewpoint of correctness of expression that I offered the terms, "Power Component," "Energy Component," and "Fuel Component."

The Power Component would be measured in either kw or kva; the Energy Component in kwhr, the Fuel Component would be an adjustment of the energy component. These would make total bill....

John M. Turnbull
Western Massachusetts Electric Co
West Springfield, Mass.

SUPERIOR PERFORMANCE BECAUSE...

MOLONEY DISTRIBUTION TRANSFORMERS ARE DESIGNED AND MANUFACTURED TO MEET ALL SYSTEM REQUIREMENTS

1

Research and Development Laboratory—A continuous program by R & D personnel is in progress at Moloney to improve design theories and procedures to keep pace with the ever changing needs of the electric utility industry. In 1959 these facilities were doubled and the most modern equipment available was installed. Thus Moloney continues to maintain its unique position of independent leadership in the ability to solve utility transformation problems.

2

Materials Testing Laboratory—Material must pass rigid tests to prove that it will contribute to the overall performance of the transformers, before approval. Then, detailed specifications, describing the high quality required, are sent to suppliers. To assure that these high standards of quality are maintained, materials are constantly tested (i.e. oil for contamination by foreign matter or water, core steel for watts loss per pound, etc.).

3

Modern Assembly Facilities—Most utilities maintain only a minimum inventory of spare transformers. Manufacturers, therefore, must be in a position to produce replacement stock quickly and efficiently. Moloney is well equipped to do this because its modern assembly lines are designed for high capacity and are flexible enough to manufacture units having special features without interruption of production schedules.

Comparative analysis of distribution transformers invariably leads to one conclusion . . . the best distribution transformer has all characteristics of design carefully developed in respect to their contributions to system efficiency, dependability and economy.

In Moloney Distribution Transformers, no one feature, electrical or mechanical, is radically improved at the expense of another. Instead, each part of the design is carefully considered and balanced with the others, to provide a distribution transformer that will give the best all-around system performance.

Utility systems benefit from this philosophy of design because every Moloney Distribution Transformer feature is designed to perform in the best possible manner compatible with every other aspect of the design, and thus provide "More Power To You."

To assist in the development of the design and to implement design decisions, modern, extensive manufacturing, research and testing facilities are required. Here are some of the outstanding facilities at Moloney which are used in the manufacture of distribution transformers.

Research and Development Laboratory • Seal Testing
Materials Testing Laboratory • Modern Assembly Lines
Quality Control Check Points • Automatic Electronic Testing

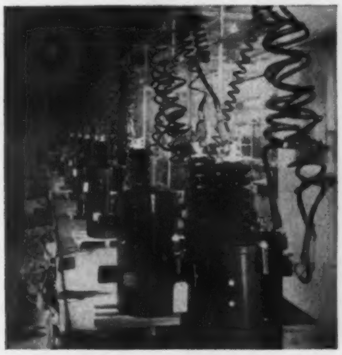
Since 1896 . . . MORE POWER TO YOU

MOLONEY ELECTRIC COMPANY
ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA
SALES OFFICES IN ALL PRINCIPAL CITIES

4

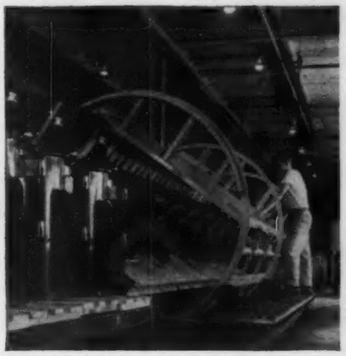
Quality Control Check Points—Moloney Manufacturing Standards are distributed to every department for the guidance of employees. These books contain complete instruction on methods to be followed, material to be used and special customer requirements. Following every major step of manufacture, quality control checks are made to verify that design and manufacturing instructions have been followed.

5



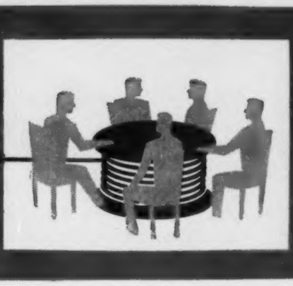
Automatic Electronic Testing—The patented, automatic electronic testing system was designed and installed by Moloney engineers to eliminate human error. Every distribution transformer receives these final tests: ratio, impulse, induced potential, applied potential, core loss, exciting current and CSP breaker tests when applicable. Any unit which fails is automatically rejected and examined to determine the reason for failure.

6



Seal Testing—After manufacturing and electrical testing has been completed, every transformer receives an inversion test. The transformer is inverted until the weight of the oil pressing against all openings reveals even the slightest fault in the gasket seals. This test gives positive and important assurance that the transformer is sealed against damage due to moisture and foreign matter.

DU PONT WIRE AND CABLE ROUND TABLE



Jacketing of ALATHON® 4 chosen by Kerite for cable with unique termination

• In this installation at Wayne, Pa., the special Kerite riser cable goes directly from the substation feeder, up the pole, and is terminated without potheads.

IN 1956, the Philadelphia Electric Company asked the Kerite Company, of New York, to design and manufacture a 38KV cable for splicing to a paper-lead cable and capable of being terminated without potheads. For this difficult assignment, Kerite selected a jacket of ALATHON 4 as one of the essential components of the cable design.

The .040″ jacket of ALATHON provides proper protection for the metal tapes. Also important are the excellent physical properties of ALATHON, allowing the jacket to be thin—thus reducing its over-all diameter and weight. Superior performance has been experienced because ALATHON is tough and flexible, even at low temperatures.

This 38KV riser cable for terminating without potheads is another example of how ALATHON helps insure reliable performance in cable construction. For more information on how ALATHON polyethylene resins can solve your wire and cable problems, write to The Kerite Company, 30 Church St., New York 7, N. Y., or to: E. I. du Pont de Nemours & Co. (Inc.), Department M-425, Room 2507A, Nemours Bldg., Wilmington 98, Delaware.

In Canada, Du Pont of Canada Limited, P.O. Box 660, Montreal, Quebec.

Du Pont does not manufacture wire and cable, but supplies thermoplastic resins to the wire and cable industry.

POLYCHEMICALS DEPARTMENT

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ALATHON®
POLYETHYLENE RESINS

RULAN®
FLAME-RETARDANT PLASTICS

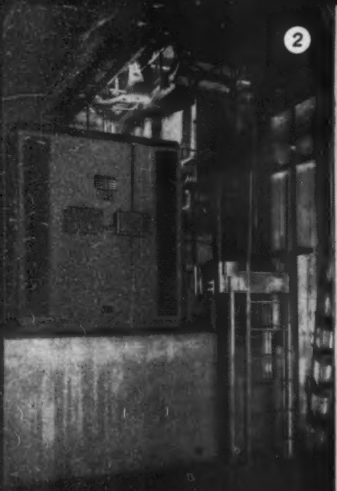
ZYTEL®
NYLON RESINS

CONCENTRATION

RT&E was founded and operates today on a very basic premise: do one thing and do it better than anyone else. That's why you'll find engineers at RT&E thinking and doing things with transformers that nobody else has ever done . . . why engineering talent at RT&E is concentrated on *one* idea . . . a better transformer. This concentration can pay off for you. Proof? Write for Bulletin 101.

RT&E Corporation · Waukesha, Wisconsin · Portland, Oregon · Arlington, Texas

①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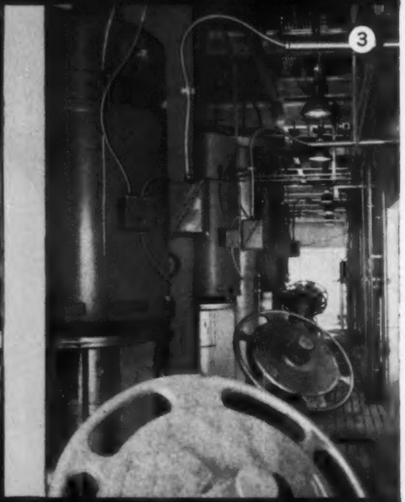

③

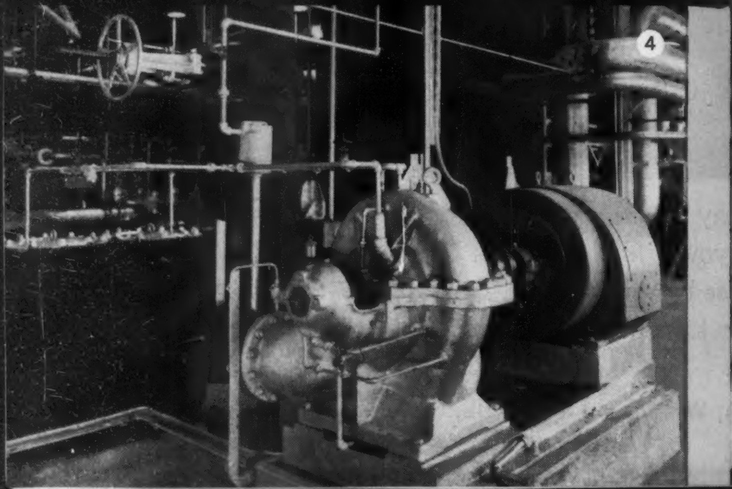
1. Twin 600-hp, 225-rpm vertical Elliott motors drive condenser circulating water pumps rated 84,000 gpm each at 25-ft total dynamic head. Pumps are located in screen house on Lake Erie shore.

2. (Far Left) One of the two 1750-1250-hp, 890/710-rpm Elliott induction motors that power the two forced-draft fans, each with capacity to move 370,000 cfm of air.

3. (Near Left) Four vertical single-stage water-cooled boiler circulating pumps deliver water at 6480 gpm driven by 300-hp, 1800-rpm vertical Elliott motors. Water is pumped to four drums, mounted on furnaces.

4. (Lower left) Elliott twin strainer and 300-hp motor serve this sluice water pump in supplying water to ash hopper for quenching red-hot ash.

5. (Below) One of two 456,000-cfm induced-draft fans driven by 2250/1750-hp, 705/585-rpm Elliott induction motors.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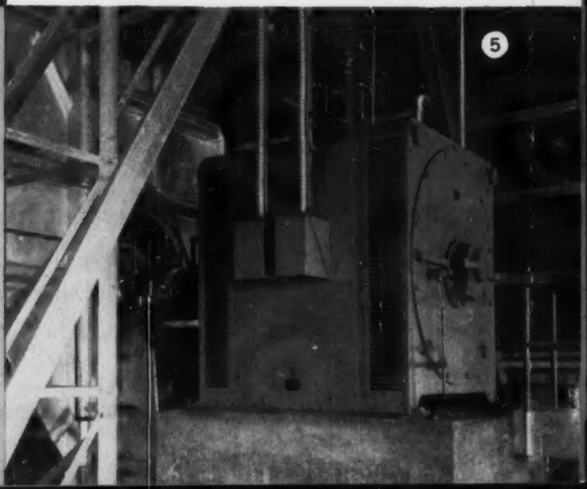
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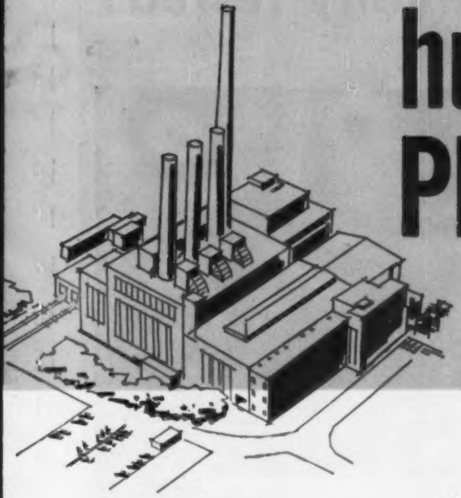
Elliott Motors drive auxiliaries in huge CEI Ashtabula Plant Extension

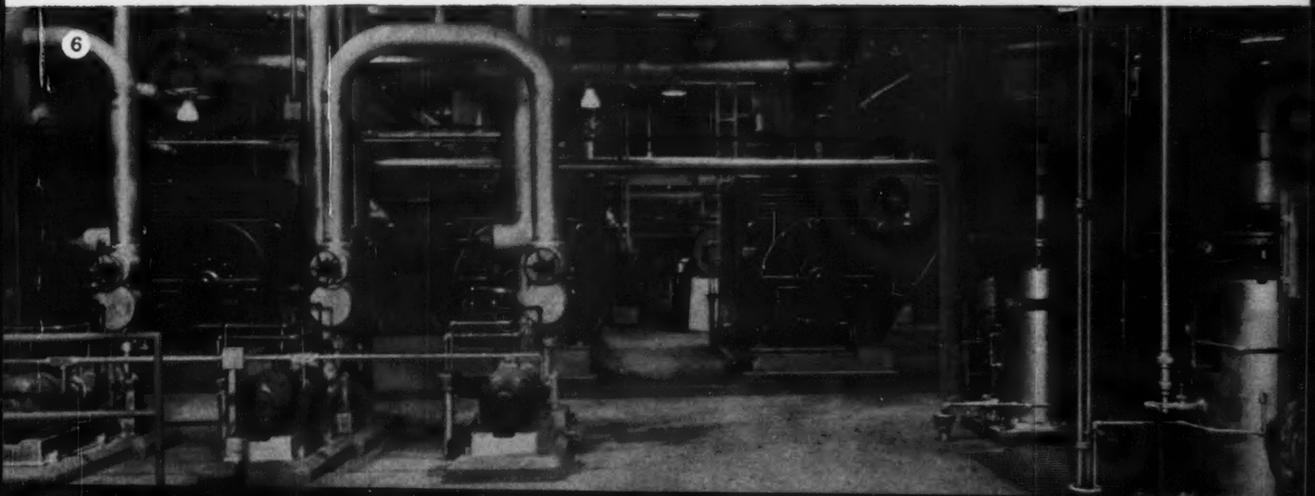


The addition of Unit No. 5 doubles the capacity of Cleveland Electric Illuminating Company's Ashtabula Power Plant. Here twenty-seven Elliott motors in sizes from 25 hp to 4000 hp drive all major auxiliaries. With few exceptions, all motors are squirrel-cage induction type with open dripproof enclosures and Class "A" insulation. Motors of 250 hp and above are three-phase, 4000-volt class and are equipped with thermocouples for automatic temperature scanners. Each motor has been carefully coordinated with its driven equipment to assure maximum reliability and overall economy.

6. In the photograph below are shown four sizes of Elliott motors which provide pumping and pulverizing power in CEI's Ashtabula Unit 5. At right, pair of 450-hp, 1200-rpm vertical motors power the condensate pumps. Trio of 4000-hp, 3600-rpm induction motors power boiler-feed pumps, background. Just visible, extreme center background, is one of eight motors driving coal pulverizer mills. Left foreground shows three of four Elliott units powering high-pressure heater drain pumps.

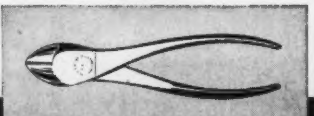
ELLIOTT
Company
Jeannette, Pennsylvania

QO-1



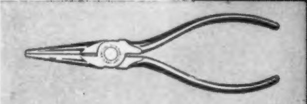
CRESTOLOY END CUTTING NIPPERS
No. 72, 6". Also in 7" size.

Each and every CRESTOLOY PLIER *is individually tested!*

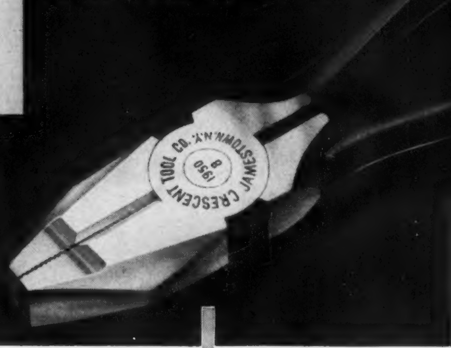


CRESTOLOY HEAVY DIAGONAL CUTTING PLIERS
No. 542, 7" size only.

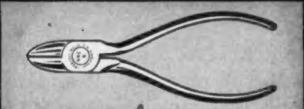
CRESTOLOY LINEMENS' SIDE CUTTING PLIERS
No. 1950, 8". Also in 6" and 7" sizes.



CRESTOLOY LONG NOSE SIDE CUTTING PLIERS
No. 654, 6". Also in 7" size.



This Plier is made of CRESTOLOY STEEL and has tested 100% satisfactorily



CRESTOLOY DIAGONAL CUTTING PLIERS
No. 942, 6". Also in 4" and 5" sizes.

When you choose a CRESTOLOY PLIER you know you are getting top value and proven performance. After rigorous factory testing for ease of cutting, hardness of blades and strength, each tool that passes these tests is tagged with the certifying tag reproduced above. CRESTOLOY PLIERS are available in more than a score of patterns including the five popular types illustrated.

CRESTOLOY PLIERS are
"Your Fingers of Steel" ®

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Sign of the Artisan
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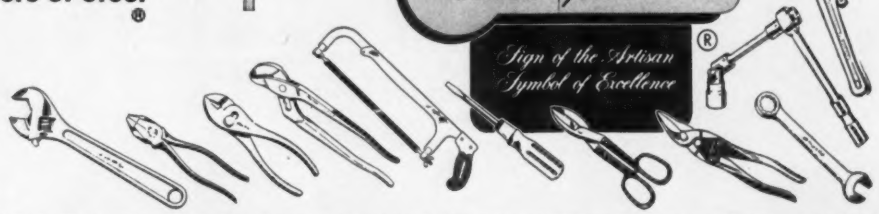

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CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

ALLIS-CHALMERS

No space problem here!

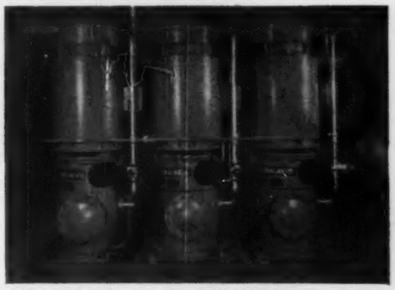
Another utility installs an Allis-Chalmers surface condenser

Illinois Power Company installed an Allis-Chalmers 125,000-sq-ft, two-pass, divided water box surface condenser at its Hennepin Station (Unit 2). Improved design resulted in space saving and reduced installation costs.

A-C special cars carried unit in just three shell sections to simplify shipping, speed on-site handling and minimize erection. Extra-compact rectangular condenser shape reduced space requirements. And Allis-Chalmers unique reverse flow design for cooling water effectively back-washes debris, ends costly shutdown, conserves space, requires no additional piping.

For details on compact A-C condensers from 100 to 200,000 sq ft and larger, call your nearby A-C office or write ***Allis-Chalmers,*** *Power Equipment Division, Milwaukee 1, Wisconsin.*

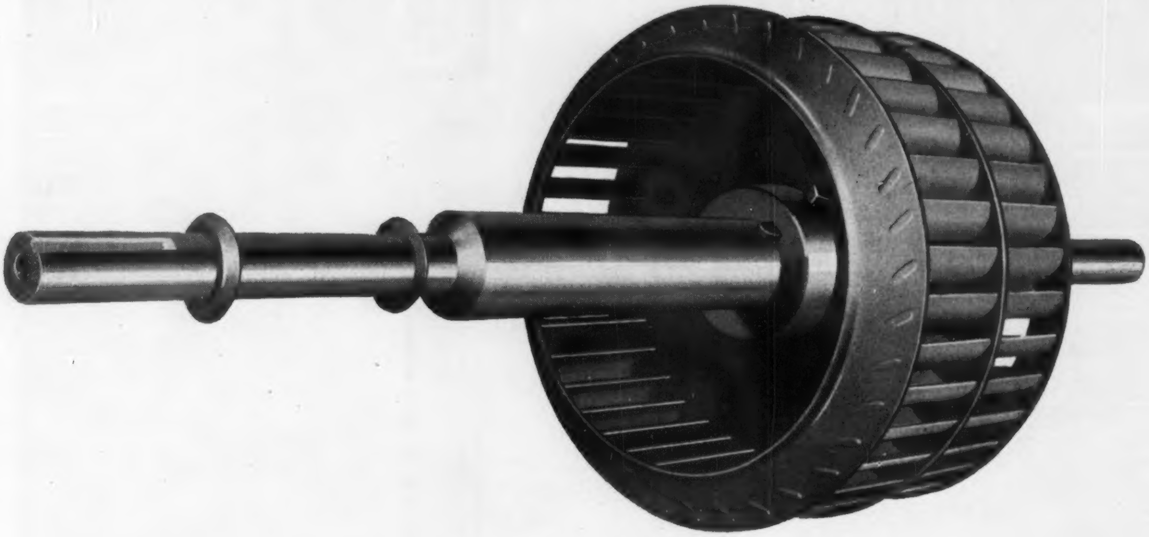
Allis-Chalmers circulating pumps with vaned elbows allow use of smaller inlet tunnels and permit adjacent pumps to be located closer together. Result, considerable saving in overall space requirements.



Allis-Chalmers vertical condensate pumps also save space. With the first stage impeller located below floor level, the required NPSH can be gained in the pump tank. This feature permits a shallower basement.

A-1274

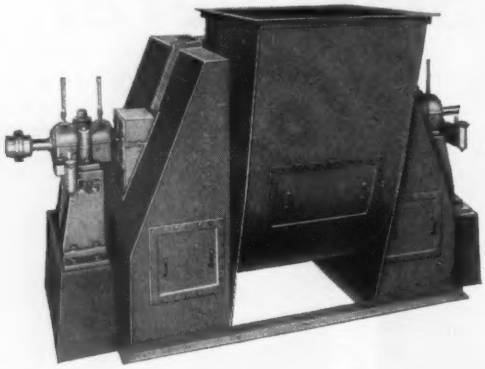
CLARAGE



Takes rough–tough jobs in stride . . . ADVANCED DESIGN DYNACURVE FAN

In the Clarage tradition of heavy-duty construction, here is induced draft equipment offering numerous advantages:

36 radially deep, aerodynamically curved blades impart dynamic energy to the gas stream which is effectively directed to achieve low tip speed operation.



Unique shape of blades and rims minimizes shock losses and turbulence, helps extend high efficiency over wide performance range, assures low moment of inertia (WR^2).

Advanced design of wheel and housing reduces floor space and height requirements for low first cost, low installation cost.

Special design and rugged construction of the wheel assures long service life and low maintenance cost.

Learn more about this stand-out fan in the induced draft field. Request Catalog 905 covering Clarage Type DN Dynacurve Fans.

Dependable equipment for making air your servant

CLARAGE FAN COMPANY

Kalamazoo, Michigan

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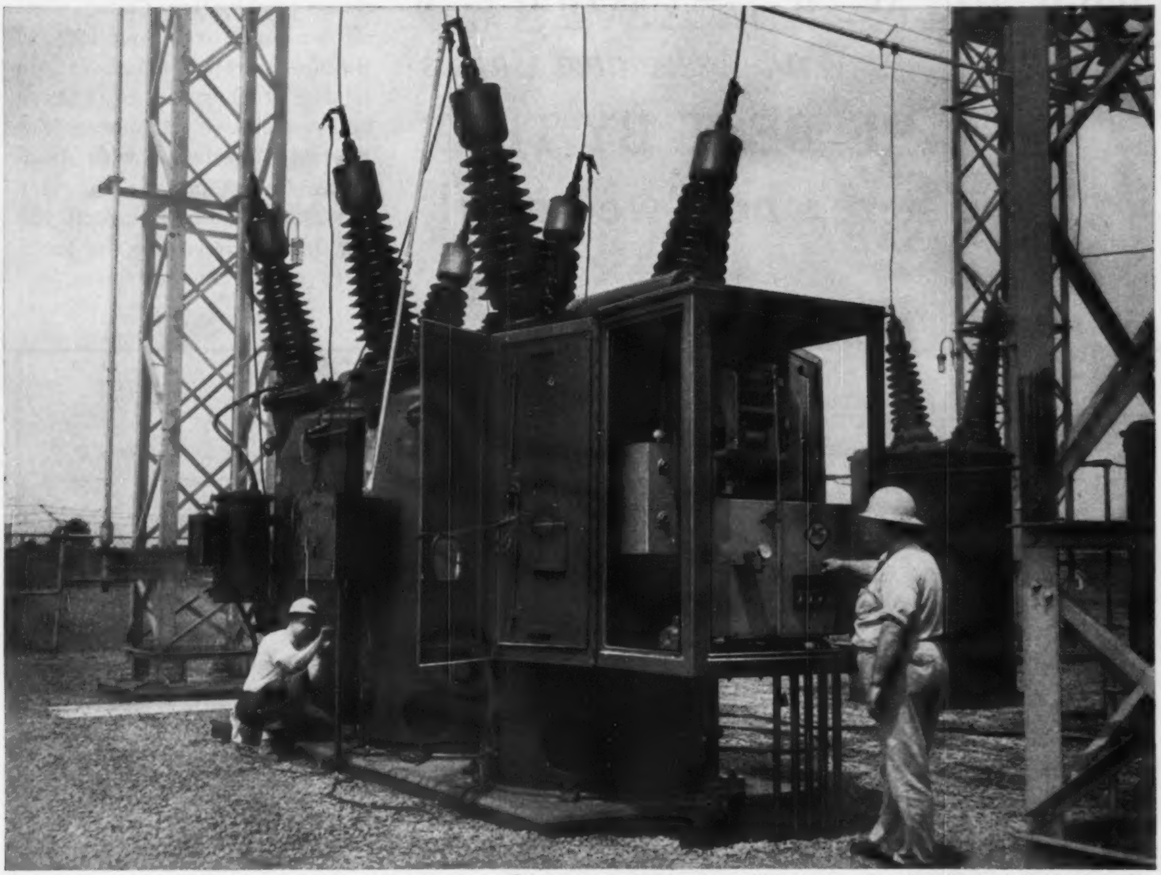


Penelec servicemen perform routine check on **Pneu-Draulic** circuit breaker operator.

Pennsylvania Electric Company reports on A-C breakers

reliable operation...remarkably little maintenance

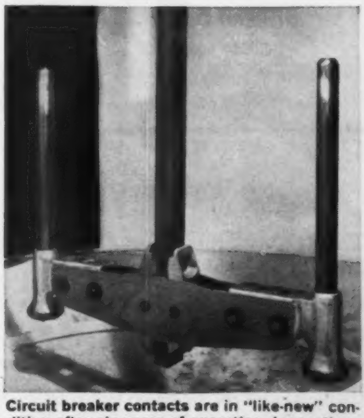
Foresight has paid off for Pennsylvania Electric Company! In 1953, Penelec became the first utility to select oil circuit breakers with *Pneu-Draulic* operators when they installed four 115-kv, 3500-mva base-mounted units. Their cooperation in helping to perform repeated field tests has been an important factor in proving the performance of this advanced operator design.

After seven years and 1576 operations, Penelec's feeder foreman reports complete satisfaction with the reliability and ease of maintenance of the *Pneu-Draulic* operator, and with the remarkably low maintenance required. Important reasons why more than 160 utilities have installed base-mounted and frame-mounted breakers with *Pneu-Draulic* operators.

Proven *Pneu-Draulic* operators feature stored energy to trigger high-speed interruption. Mechanically trip-free mechanism assures opening of breaker at rated speed under any and all conditions. And the breaker can be operated manually even when control power is not available.

Call your nearby A-C office for more outdoor breaker details (14.4 to 345 kv, 500 to 25,000 mva). Or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wis.*

Pneu-Draulic is an Allis-Chalmers trademark.



Circuit breaker contacts are in "like-new" condition after six years of operation. Inspections have consistently shown a surprising lack of oil contamination.

ROECLAMPS®

With Associated Cables

ARE BEST BY TEST
(and here's how we know!)

Up till now, in the absence of industry-wide specifications, it's been a catch-as-catch-can proposition to choose the *best* cable-clamp combination. Claims were all you could hang your hat on! But now a cycle of extensive field trials and laboratory tests prove more conclusively than ever that Roebling Roeclamps with Associated Cables provide the very best, most enduring circuit you can install. Here are the facts. They speak for themselves.

15 KV ROECLAMP TESTS

TESTS ON CLAMPS ALONE	ROECLAMP	SPACER A	SPACER B	SPACER C	SPACER D	SPACER E
Downward Breaking Strength*	1600	150	890	2200	?	?
Sideway Breaking Strength*	800	300	1475	100	?	?
Lightning and Tree Shielding Angle	16°	30°+	30°+	30°+	30°+	30°+
Short Circuit Breaking Strength	10,000 3φ Amps	?	?	?	?	?
Short Circuit (Design Test) Guarantee	Yes	No	No	No	No	No
TESTS WITH CONDUCTORS IN PLACE						
35 KV between phases	No Tracking 12 Months	Tracking end of 6 Months	Tracking end of 6 Months	Slight Tracking end of 1 Month	No Tracking end of 1 Month	?
35 KV between messenger and phase conductor	No Tracking 12 Months	Tracking end of 6 Months	Tracking end of 6 Months	Slight Tracking end of 1 Month	Slight Tracking end of 1 Month	?
Radio Interference Tests						
(a) by Corona Level Test Set	16 KV 1φ	?	No Tests	No Tests	?	?
(b) by AM Radio within 2 ft of phase conductor	26 KV 1φ	?	No Tests	No Tests	?	?
Impulse Strength	*171 KV	?	No Tests	No Tests	?	?

*Test made only on 5 KV Roeclamps with Associated 5 KV Cables.

MORE FACTS ABOUT ROECLAMPS

They're available for systems up to 15kv...they minimize tree problems, save 75% over self-supporting cables, and can be installed quickly, even with "boxing" gloves on...they don't have to be removed when making phase changes, or reinforcing system...they provide better voltage regulation and higher current-carrying capacity...they practically eliminate outages from falling limbs or lightning...and they give a more compact, more attractive installation! Let your Roebling representative show you the Roeclamp...or write today for an interesting, free booklet. Roebling's Electrical Wire Division, Trenton 2, New Jersey.

ROEBLING
Branch Offices in Principal Cities
John A. Roebling's Sons Division
The Colorado Fuel and Iron Corporation

ALLIS-CHALMERS

New Aluma-Clad switchgear combines long-range economy with

styling for the sixties

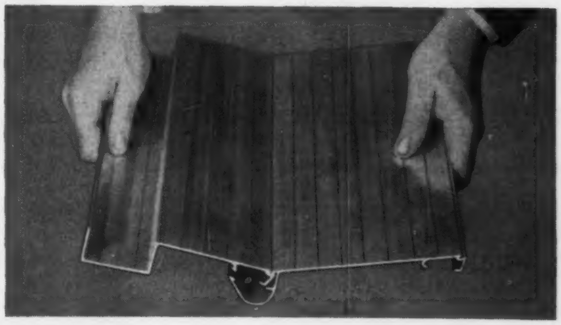
Lasting beauty, long-range economy. You get both with new *Aluma-Clad* switchgear enclosure.

Modern, functional design makes this an innovation welcome in any neighborhood. Ribbed, all-aluminum exterior is soft finished to prevent offensive glare. Color-anodized trim enhances its beauty.

Painting is completely unnecessary! *Aluma-Clad* switchgear can't rust. Its aluminum exterior resists corrosion from salt air and contaminated atmospheres.

Low installation costs! Lightweight aluminum sections dramatically reduce installation time, labor cost. Panels bolt together with aluminum alloy bolts and neoprene gasketing. Because of the unit's light weight and unusual rigidity, simple concrete piers can be used instead of heavy slabs.

Contact your nearby A-C office for complete details on *Aluma-Clad* switchgear, or write **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wis. A-1283



Interlocking modular panels snap together to form a permanent leak-proof joint. Extruded vertical joint sections, every six inches, act as reinforcement — provide exceptional rigidity.

Aluma-Clad is an Allis-Chalmers trademark.

FOR AUTOMATIC CONTROL OF STEAM STATIONS

An RW-300 system in a steam station can pay for itself by improving service continuity, increasing safety for personnel and equipment, and reducing operating and maintenance costs. RW-300 computer control can reduce the probability of major accidents, decrease the number of outages, and ensure faster return to service following an outage. In addition, through monitoring plant performance and computing heat rate, computer control can provide significant fuel savings.

Many utility leaders are now considering computer control of boiler-turbine-generator units, and uppermost in their minds is the question of system reliability. Field reliability can be proven only by on-line systems standing up under continuous service in rugged industrial environments. Every day more than a dozen RW-300 systems are operating around the clock in a variety of industries.

For further information, call or write Mr. Raymond E. Jacobson, Director of Marketing, Dept. **EW-1077-2.**

RW-300

the most field-reliable computer control system . . .

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ELECTRICAL
WORLD

The Electrical Week

LATE NEWS ▶ Around the States . . . Virginia E&P gets FPC license for 200-Mw hydro station on Roanoke River near Gaston, N. C. . . Petitions are being circulated in Salem, Ore., for a People's Utility District. If it goes through, Portland GE would lose a block of customers . . . Arkansas co-ops reach tentative agreement with Southwest Power Administration and Southwestern Electric Power Co on power exchanges. Co-ops will build plant at Ozark, then wheel power over company and SPA lines.

Interior Dept raises residual fuel oil import quota to 490,000 barrels a day through June 30. Gulf Oil goes to court to get its share.

Lehman Bros will advise TVA on issue of its revenue bonds.

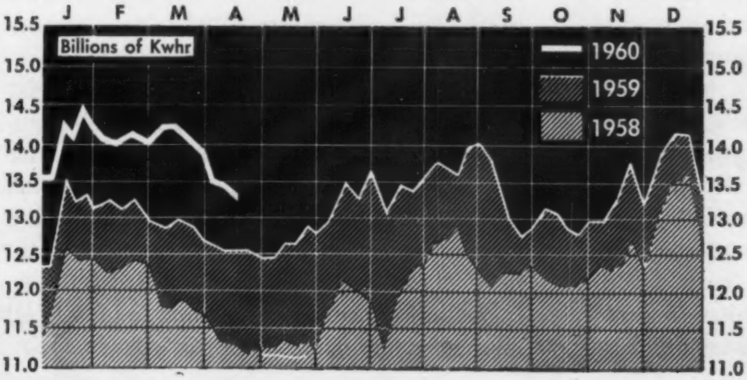
New Jersey P&L offers to build hydro plant in conjunction with government dam projects on Delaware River. Corps of Engineers is building Tocks Island Dam; NJP&L would spend $50-$80 million on power facilities. Jersey Central P&L and Public Service E&G would cooperate in operating the plant.

Cincinnati G&E asks for 16% rate increase from City Council. Cost to customers would be about $4.5 million a year. The company recently settled with IBEW for a 4% wage increase.

European interest in nuclear power is declining. The third annual report of European Atomic Energy Community—an agency of the Common Market countries—reflects a wane in A-power interest. High costs are given as the principal reason.

Management changes . . . J. J. Tuohy, president of Long Island Lighting, is also named chief executive officer. F. C. Eggerstedt Jr is elected a vp . . . F. C. Moreton named board chairman of Utah P&L. . . . C. F. Adams becomes board chairman and R E. Krafve president at Raytheon Co.

WEEKLY POWER OUTPUT—Up 5.2% (Week ending Apr. 16), Kwhr 13,263,000,000



Per Cent Change From Previous Year

	Apr. 2	Apr. 9	Apr. 16
Total U. S.	+ 7.3	+ 7.1	+ 5.2
New Eng.	+ 6.9	+ 7.7	+ 5.4
Mid. Atlan....	+ 7.7	+ 8.5	+ 5.1
Cent. Ind.	+ 7.3	+ 7.2	+ 3.8
West Cent. ...	+ 2.7	+ 7.2	+ 5.4
Southeast	+ 5.9	+ 6.9	+ 3.6
South Cent. ...	+ 7.6	+ 5.6	+ 8.8
Rocky Mount...	+ 7.7	+ 7.7	+11.6
Pacific			
NW	+ 7.9	+ 4.1	+ 8.1
SW	+ 8.8	+ 7.5	+ 5.1

Seasonally Adjusted Index 267.3

Week Ago 270.8 Year Ago 252.8

Source: Edison Electric Institute

Preview of This Issue

EVENTS ▶ **The AEC Hanford reactor won't get power facilities this year.** The drive in Congress to add 636 Mw to the plutonium producer bogged down **(p 64)** . . . California PUC decides on treatment of accelerated amortization and liberalized depreciation for rate-making purposes **(p 64)** . . . Private utilities and preference customers disagree on use of power from proposed Colorado project **(p 66)** . . . Utilities challenge proposed Bureau of Reclamation transmission lines in Iowa **(p 68)**.

ENGINEERING ▶ **The American Power Conference in Chicago** heard papers on advances in generation peaking, steam and nuclear generation, EHV transmission, distribution and computer applications by experts from utilities and manufacturers **(p 69)** . . . Twin loop feeders, secondary ties, and ample transformer capacity at Western Electric's Oklahoma City plant make for a design that assures service continuity and allows for future growth **(p 72)**.

ELECTRIC UTILITY METHODS REPORT ▶ **Highlights of the second EUM report in 1960:** Hydraulic rig lifts 240-Mw generator 27 ft for Oklahoma G&E **(p 110)** . . . Oscillograph verifies operating sequence of tap changer at Baltimore G&E **(p 112)** . . . One lineman on 40-ft boom repairs conductors atop 405-ft tower for Mississippi P&L **(p 114)** . . . Twenty other methods

Politics and Public Power

FPC AND ELECTION-YEAR POLITICS

The Federal Power Commission—one of the agencies in Washington most important to the power companies—has become one of the shuttlecocks of the just-heating-up political campaign.

Chairman Kuykendall and commissioners Connole, Kline and Stueck have all been caught up in the controversy—and they will be quizzed in a new round of hearings set for May 2. Already, there are reports in Washington that Commissioner Connole—whose term happens to expire in June—won't be re-appointed. These reports have it that his stringent attitude toward regulation on behalf of the consumer has angered some of the gas interests, and they, in turn, have brought pressure on the Administration to block his re-appointment. Regulatory officials of seven states have recently written to the White House urging his re-appointment.

The issue being touched up, with the happy help of the Democrats, has plagued the Administration and other agencies before. It is: To what extent are the regulators' decisions on matters of public interest being influenced by private consultation with lobbyists and others whose roles aren't known until the investigators splash them on the front pages?

It should be pointed out about here that ex parte meetings between commission members and company representatives are, under the right circumstances, perfectly legitimate. The ex parte meeting has become part of the machinery for expediting commission business. If every case had to be settled by hearings, the FPC could never hope to handle all matters which come before it.

offer proven solutions to problems in construction, operation, maintenance, stores and shops. New Equipment starts on **page 93.**

PROCUREMENT & PRODUCTS ▶ **The key to supplying coal economically during the next 10-15 years** lies in a combination of long-term contracts, dedicated reserves, and volume-moving agreements with the railroads, according to one coal executive **(p 81)** . . . Line Material plans more esthetically pleasing poles for carrying lines in congested areas . . . General Electric completes modification of Vallecitos boiling water reactor **(p 84).**

MANAGEMENT ▶ **Will we cloak the notion of profit with sugar coated labels and disguise our quest for it in the 60's with half-hearted apologies?** An electrical manufacturer who hopes we won't, John R. Conrad, president of S&C Electric Co, stated his views at the recent American Power Conference. A condensation of his speech starts on **page 173.**

SELLING ▶ **Surplus capacity becomes commercial cooking load.** That's what happened when Florida P&L sold surplus capacity to a Miami hospital when it installed air conditioning **(p 161).**

NEXT WEEK ▶ **Read about the highlights of EEI's 26th Annual Sales Conference.**

Thus far, there's no indication that electric utilities will be put into the spotlight the way the gas pipeline companies have been.

One gas company—Tennessee Gas Transmission—since 1952 has retained Thomas G. Corcoran, one-time New Deal brain truster, at $60,000 a year to work on its Washington problems, including meetings with FPC commissioners on a case up for decision after the record was closed.

Corcoran will be called before the investigators this time, along with the commissioners.

As a matter of fact, there's no evidence that the FPC has given away anything, or acted except in the public interest. But there's no doubt that the stories spread on the record and in the newspapers have given the appearance of an environment at FPC that makes it possible to raise the question.

Critics of the commission are digging into the FPC record to find fuel for the blaze they've got going.

For instance, they charge that Chairman Kuykendall misled Congress back in 1955 when he told a committee that Idaho Power Co's Hells Canyon application was still being considered. Instead, they say, the record shows the commissioners had decided to approve it the day before—although the decision wasn't announced until after Congress adjourned that year.

Another case they cite is the commission's approval of $300 million of fast tax write-offs for Idaho Power, after giving as one reason for the award the fact that no government financial help would be needed. Idaho later declined the certificates.

These are some of the ingredients that Presidential and Congressional politics are made of—and this is a big election year.

Executive Reader

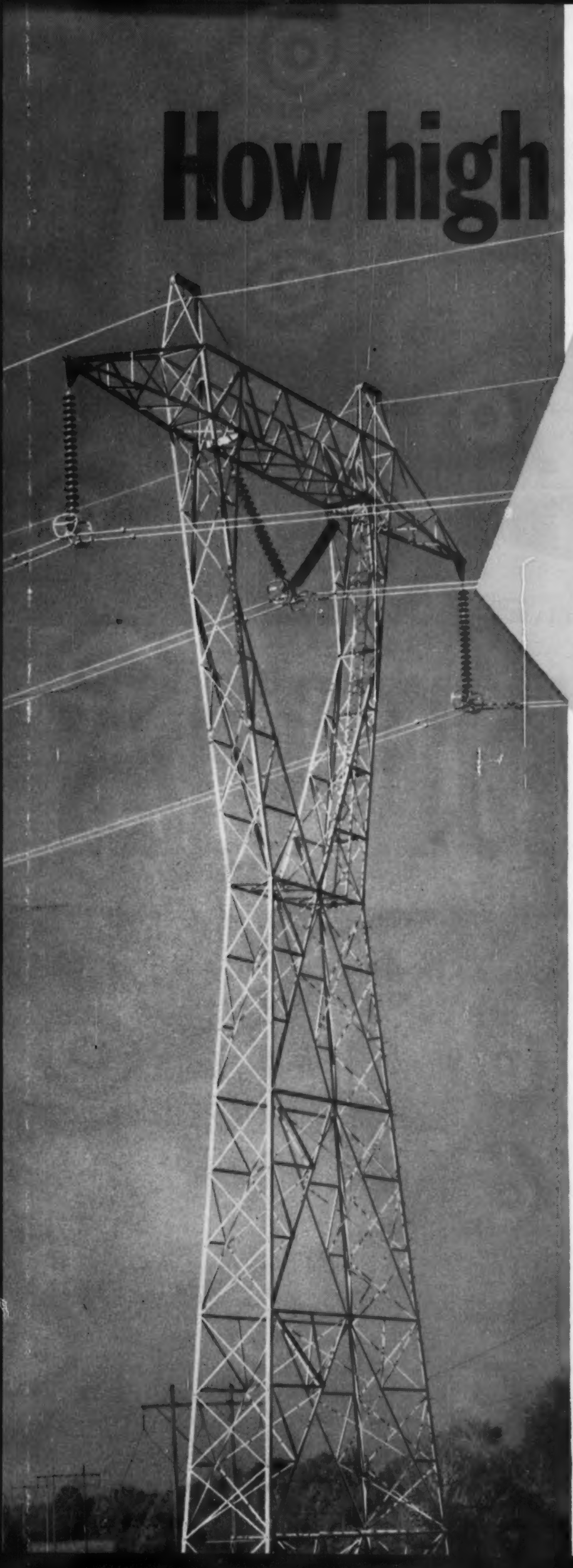
A new method of pole procurement, effective July 1, will enable REA borrowers to take advantage of experience and advances in the timber and insurance industries. One feature of the method is an insured warranty plan covering pole replacement within 11 years of purchase due to rot, decay or insect damage. Eighteen questions most frequently raised over the new specifications are answered in the publication **"Questions and Answers about a New Method of Pole Procurement," Rural Electrification Administration, U. S. Dept of Agriculture.**

Research in the gas industry is pointing toward these new uses: Blowers, fans, pumps, defrosters, and dryer drums powered by thermoelectric devices and fuel cells; a thin, flexible, flameless burner tube to put heat where it is needed; gas infrared comfort heating for seats in public arenas; zoned heating and air conditioning; and a gas "power center" for residential air conditioning, refrigeration, and kitchen appliances. **Harold Massey, Gas Appliance Mfgrs Assn, Steel, April 11, 1960.**

The world of antitrust by ordinary standards is a world of conflict, insecurity and confusion. The power of Mr. Bicks seems clear enough, and enormous in the sense that his viewpoint and his program tend to become the government's official antitrust doctrine. These comments illuminate the state of federal antitrust laws and the character of acting Assistant Attorney General Robert A. Bicks, who is keeping a lot of corporation lawyers busy with a record number of antitrust prosecutions. **What Antitrust Means Under Mr. Bicks, Richard Austin Smith, Fortune, March, 1960.**

A cadet training program should be an integral part of the management development plan for companies such as Connecticut Light & Power Co. The company's program consists of assignments and evaluation of work in power plant, district, and headquarters, for a total of 104 weeks. Based on 4½ years of experience, the program could be improved by shortening it through a bias toward the cadet's anticipated assignment to production, or transmission and distribution; by better forecasting of cadet placement upon completion of the program; and by improving training methods to fulfill the cadet's desire for some challenging assignments during the training period. **A Cadet Program in Action, Russell Hicock, EEI Bulletin, March, 1960.**

The utility company receives the greatest benefit from liberalized depreciation for tax purposes if the commission allows normalization and includes the tax reserve in the rate base. Present ratepayers seem to benefit most if the "flow through" method is allowed. An analysis of liberalized depreciation may provide help in appraising a current tax depreciation setup more realistically. **Alternative Tax Depreciation and the Regulated Utilities, Carroll M. Perkins and Martin T. Farris, Public Utilities Fortnightly, March 31, 1960.**



How high tomorrow?

O-B insulators and hardware are ready now for tomorrow's EHV

Our broad experience on EHV test lines, on EHV operating lines, and on our own EHV research programs indicates that O-B insulator and hardware designs need place no upper limit on transmission voltages.

The designs you'll need tomorrow, in other words, are quite possibly the same O-B designs you're using right now!

No other insulator and hardware manufacturer offers greater breadth or depth of experience with Extra-High Voltage transmission.

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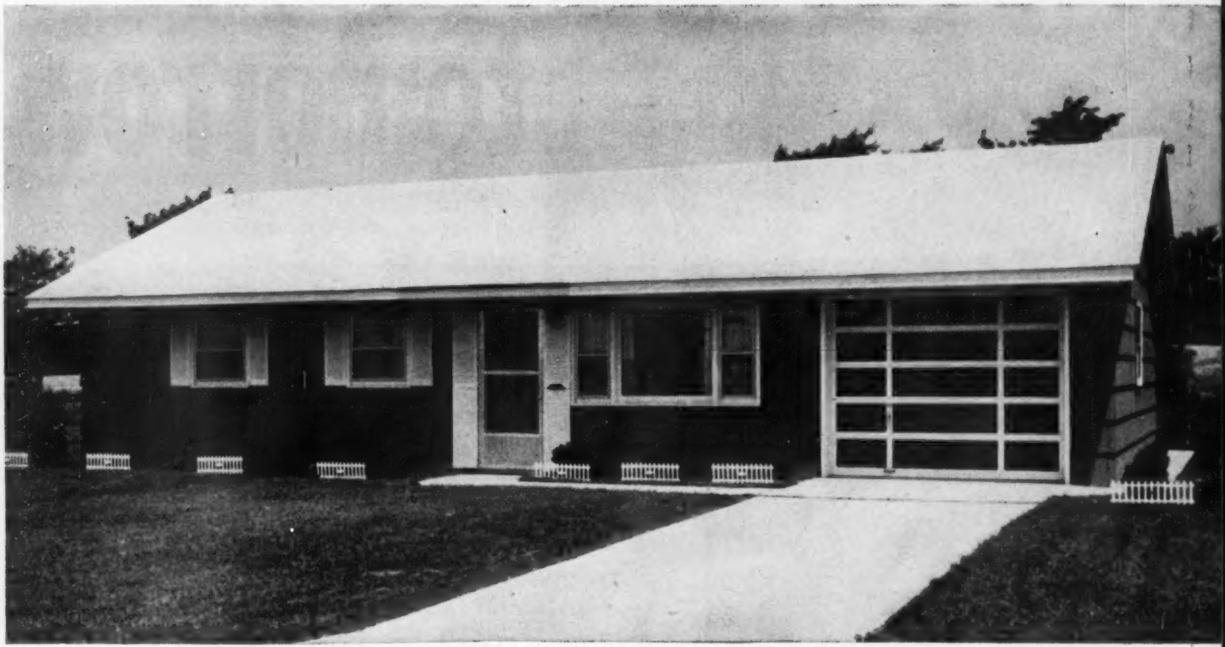
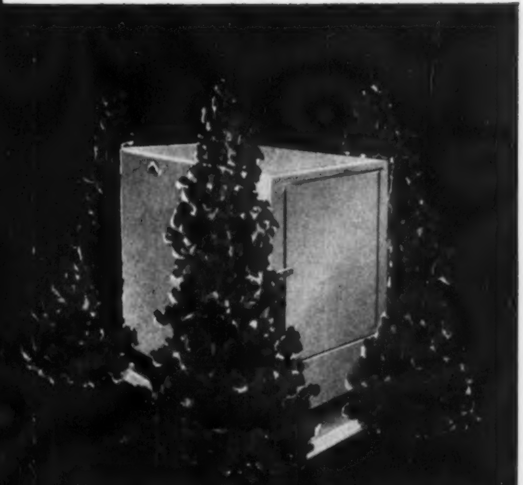


NEW LOW-LOSS



RESIDENTIAL
Standard Padformer installs in less than 30 minutes. Landscaping conceals it. All wiring underground. Installed in Midwest metropolitan development (left) where heat is all electric!

Standard's distribution PADFORMER fits snug against a building, hides in the shrubbery or stands right out in the open in a shopping center parking lot. More than 400 have completed three years' service! They're field-proven! Both power and distribution units are available right now.

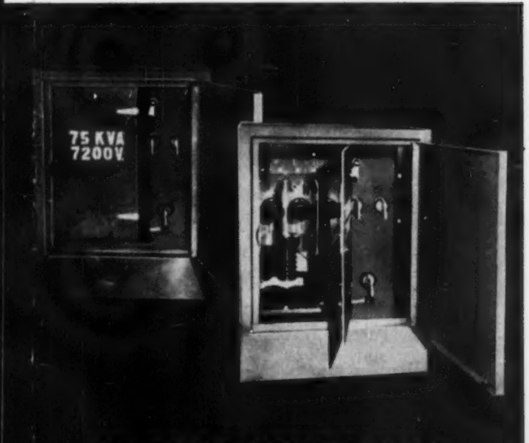
Standard's PADFORMERS can be equipped as you specify. Compartmented design permits changes in single phase units without a change of terminations with complete flexibility, from 15 KVA through 50 KVA and 75 KVA through 167 KVA. High voltage side is protected by an inside door which permits you to work on the secondary in total safety.

NEW HIGH IN PERFORMANCE

PADFORMERS have the same characteristics as Standard's pole-type distribution units. They reduce copper losses 30% at full load . . . deliver more power to the meter . . . reduce impedance . . . slash temperature rise without excessive voltage drops. YOU SELL MORE OF YOUR TOTAL SEND OUT!

Ask your nearby Standard Transformer representative about how they can increase your revenues. Contact him today!

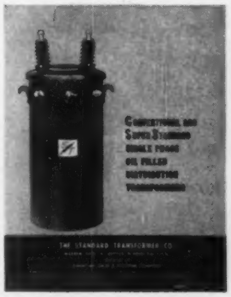
PADFORMER



POWER OR DISTRIBUTION units mount in minutes. Compartmented design permits changeout without changing terminations. Doors lock with hasp and padlock. Power and distribution units IN SERVICE WITH LEADING UTILITIES NOW!

FREE BOOKLET SHOWS HOW TO determine the INCREASED REVENUE Standard distribution units can build on your system without any increase in generating or transmission equipment.

WRITE FOR IT TODAY.



41 Years of Concentration on Transformer Design Exclusively

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WARREN, OHIO
"WHEREVER THERE IS POWER"

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NEW UTILITY STATIONS, C-E EQUIPPED

Includes only new stations on new sites placed in operation since **JANUARY 1, 1950.**

LAKE CATHERINE
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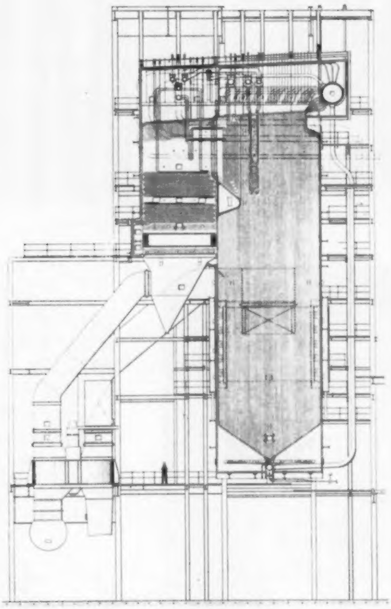
DANSKAMMER
BECKJORD
HIGHGROVE
PLANT X
BLACK DOG
ALBANY
JOPPA
MERAMEC
PORTSMOUTH
LAKE CREEK
ETIWANDA
AURORA
HENNEPIN
EASTLAKE
OAK CREEK
SUWANNEE RIVER
URQUHART
KINGSTON
SANDOW
MULLERGREN
BARRY
NORTH OMAHA
WILMINGTON
CARBON
SAGUARO
MORRO BAY
VERMILION
JOHN SEVIER
COLLIN
MILLIKEN
GALLATIN
BARRETT
MITCHELL
SAN BERNARDINO
YORKTOWN
GULF COAST
TUCSON
PORT WENTWORTH
W. A. PARISH
ALLEN
MONTROSE
McMEEKIN
LEWIS and CLARK
ROY S. NELSON
YUMA AXIS
DICKERSON
DAN E. KARN

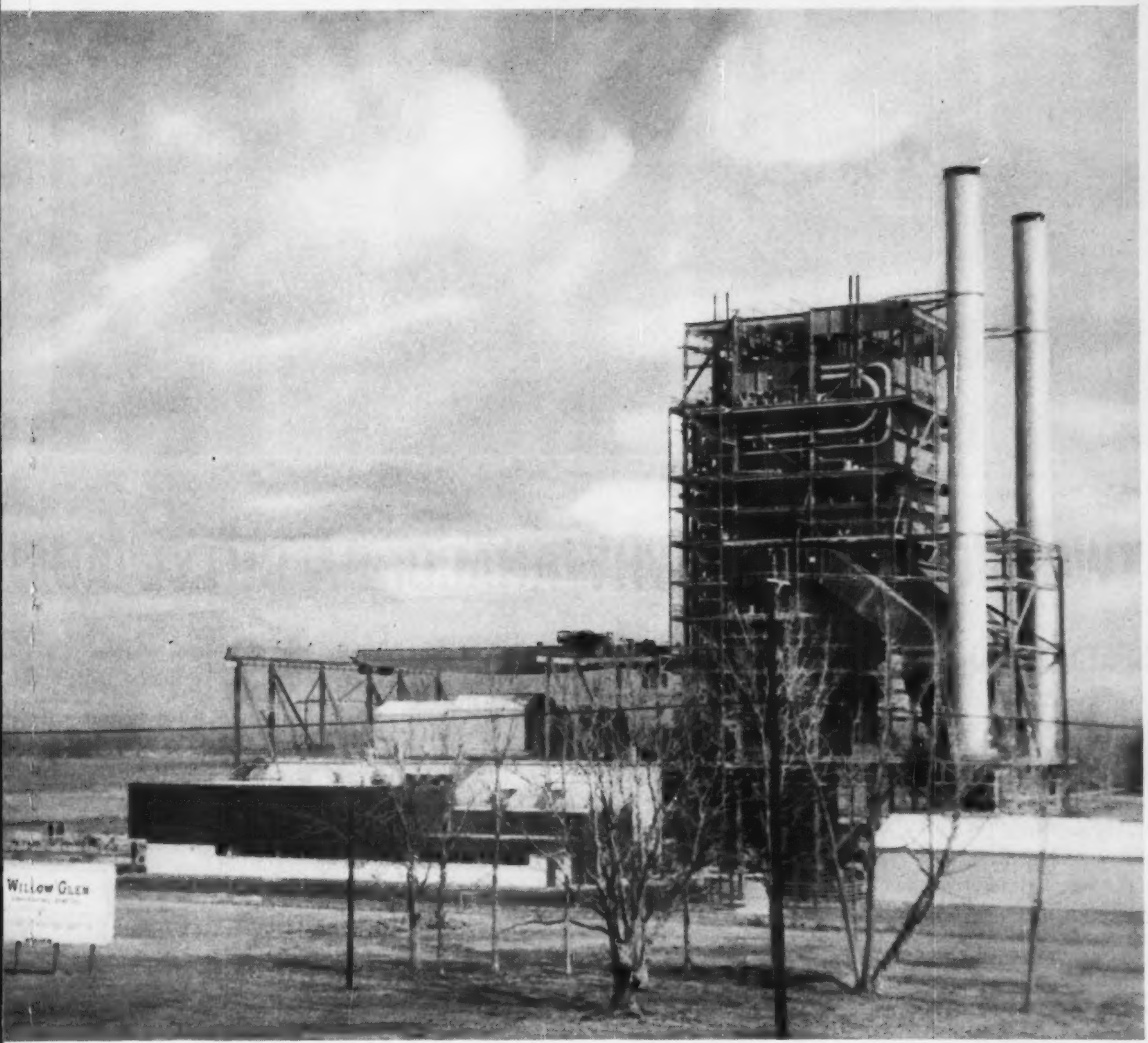
WILLOW GLEN

NEW WILLOW GLEN STATION

Goes into Service



This C-E steam generating unit is now in service at the Willow Glen Power Station of Gulf States Utilities Company. It is a radiant reheat boiler, with the reheater section located between the primary and secondary superheater surfaces. An economizer section is located below the primary superheater surface in the rear pass. Regenerative air heaters follow the economizer section. This unit is designed to produce 1,100,000 lb of steam per hr at 1800 psi throttle pressure and 1000 F reheated to 1000 F. Primary fuel is natural gas with provision for burning oil through C-E Tilting, Tangential Burners. It is arranged for future coal firing.



Recently placed in service for the Gulf States Utility Company was the first 162,000-kw unit at their new Willow Glen Station. This station is located at a fast-growing load center approximately 15 miles south of Baton Rouge, Louisiana, on the east bank of the Mississippi River at St. Gabriel, Ascension Parish.

A second unit, rated at 220,000 kw, is scheduled to go into service the first part of 1964. The total generating capability at the Willow Glen Station will eventually exceed 1,000,000 kw.

The circulating cooling water is obtained from the Mississippi River. The station was designed and constructed by the Stone & Webster Engineering Corporation. Steam for both of the turbo-generators here is supplied by Combustion Engineering radiant reheat boilers, the first of which is shown in sectional elevation and briefly described on the opposite page.

COMBUSTION ENGINEERING

C·E

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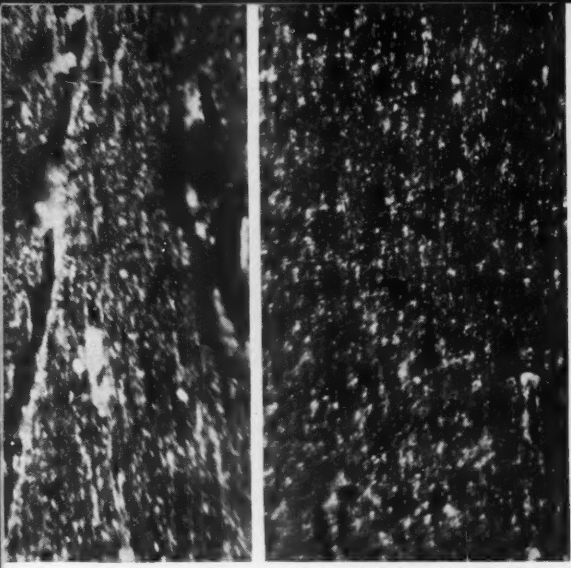
Combustion Engineering Building
200 Madison Avenue, New York 16, N.Y.

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE



Above you see magnified sections of ordinary cable insulation (left) and Anaconda Butyl (AB) Cable insulation (right).

These screens, used in the extrusion head to entrap possible contaminants, are so fine they actually hold water.

TWO BIG REASONS WHY ANACONDA BUTYL (AB)

1. SPECIALIZED DEVELOPMENT

Because Anaconda was the first to develop butyl-insulated cable—and because butyl handles differently from other rubbers—many problems came up during development. Here are some examples—and how Anaconda engineers solved them.

A mixing problem: Like all raw rubbers, butyl in its raw state is a practically useless material. So it's mixed with specially selected additives and ingredients. Because it is very difficult to disperse these ingredients in butyl, Anaconda had to develop an entirely new mixing process and separate facilities to avoid contamination. Look at the comparison photos and see how successful it is.

A shielding problem: To eliminate laborious and time-consuming cleaning of insulation surfaces, Anaconda developed a semiconducting tape* which firmly adheres to the insulation—and yet is easy to remove during splicing and terminating.

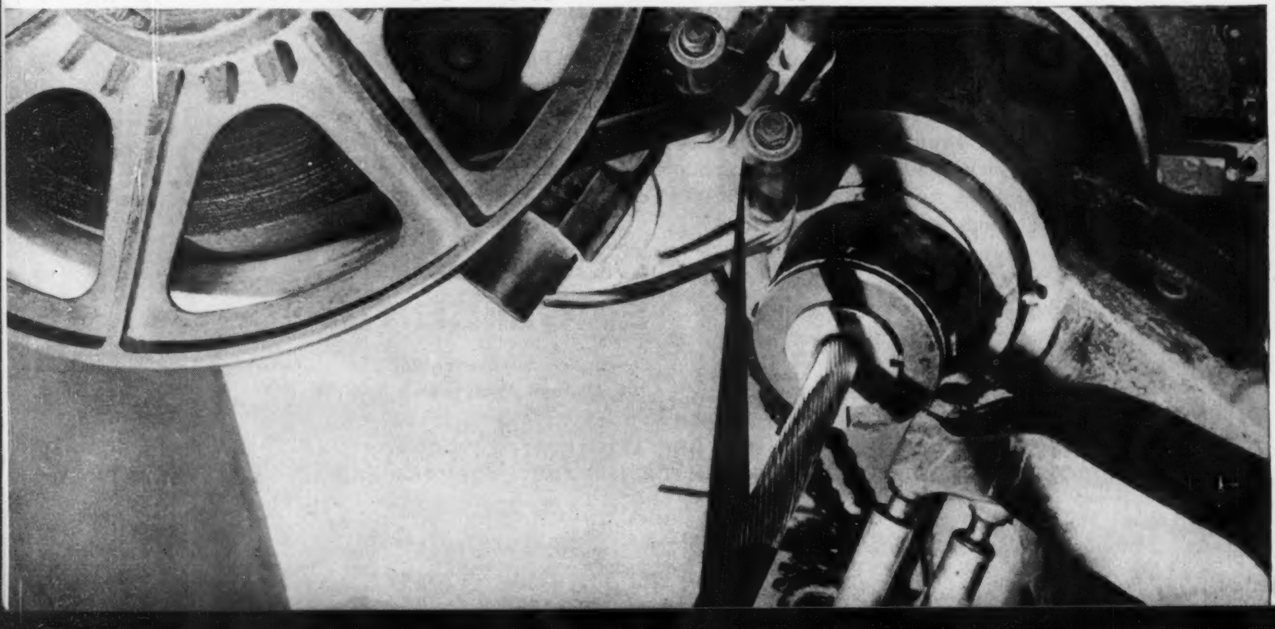
Even a vulcanizing problem: Ordinary vulcanizing equipment might have a tendency to deform butyl insulation. So Anaconda developed huge vulcanizing tanks which admit steam faster, vulcanize quicker and eliminate distortion.

These few examples show you the types of problems Anaconda engineers were up against. Their solutions help show you why you can be sure Anaconda Butyl (AB) Cable is the finest cable you can buy.

2. SPECIALIZED MANUFACTURE

Anaconda's new Marion Mill was designed to handle only one product—Anaconda Butyl (AB) Cable.

Close-up of semiconducting strand-shielding tape being applied to 500-Mcm tinned copper conductor.



An Anaconda development—semiconducting tape—adheres firmly to insulation, yet removes easily, facilitating splicing and terminating.

MEANS RELIABLE HIGH-VOLTAGE CABLE

The men behind this highly specialized equipment have but one job . . . to study and improve the design and manufacture of rubber-insulated high-voltage cable. Here are a few of the many places where they built precision right into the production line.

Insulation purity: For extra protection against contamination, the unvulcanized Anaconda Butyl is passed through a series of screens, one of which is so fine it will hold water.

Strand-shield taping: For better equalization of internal electrical stress, Anaconda applies a special fine-mesh semiconducting tape under the insulation of all stranded high-voltage cables.

Vulcanizing in lead: Conventional lead presses must stop periodically for refilling—severely heating up and often damaging the cable section in the die block, so Anaconda extrudes lead continuously. In the next step, exceptionally large drums are used for vulcanizing in lead to eliminate distortion of jackets and insulation.

These few examples help show you that the manufacture of Anaconda Butyl (AB) is highly specialized, highly precise—and why Anaconda offers you the big advantage of consistent high quality.

*Pat. applied for 00237

ASK THE MAN FROM

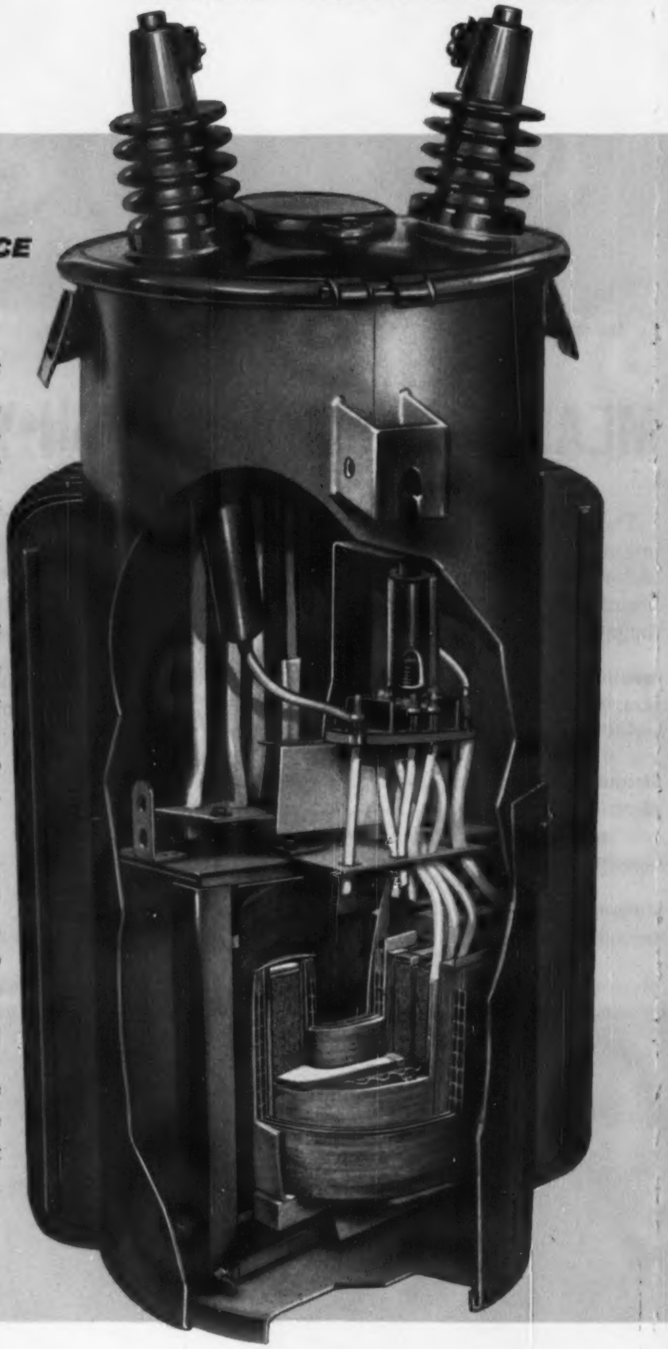
ANACONDA®

ABOUT BUTYL (AB) HIGH-VOLTAGE CABLE

Huge reel entering large vulcanizing tank which vulcanizes cable quicker than conventional methods, eliminating distortion of insulation.

Get the most for your

with WAGNER



MORE FOR YOUR MONEY IN ELECTRICAL PERFORMANCE

CORES WITH LOWER LOSSES

Wagner Form W cores are made of highest quality annealed steel, and are skillfully constructed to provide a low reluctance path for the magnetic lines of force to keep losses and exciting current low.

COILS WITH LOWER IMPEDANCES

Wagner Form W coils are wound of carefully selected and tested copper wire or strip. Layer, channel and barrier insulation is coated with a thermo-setting material that bonds the coil structure into a mechanically strong, electrically efficient, quiet-operating unit.

Recent Wagner engineering developments in the method of insulating and winding coils of pole type distribution transformers have made it possible to provide impedances from 10% to 15% *below* present impedances. At the same time, short circuit strength is greatly increased. Short circuit tests, with full line voltage applied, prove that these transformers are capable of withstanding short circuit stresses far in excess of industry standards.

SERVING 2 GREAT GROWTH INDUSTRIES—*ELECTRICAL...AUTOMOTIVE*

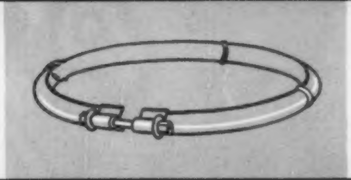
distribution transformer dollar

FORM W TRANSFORMERS

At Wagner, research and development teams are constantly working on distribution transformer improvements. They are testing new methods and materials . . . developing new design concepts . . . in a constant search for improvements that will give you the most from your distribution transformer investment. The result: better electrical performance . . . longer lasting parts . . . improved mechanical features—to give you all the characteristics you want in transformers for your distribution system.

A complete line of Form W pole-type transformers, from 3 to 167 kva, 15 KV and below, is available from factory, branch, and distributor stocks. Consult your Wagner Sales Engineer about your transformer requirements, or write us.

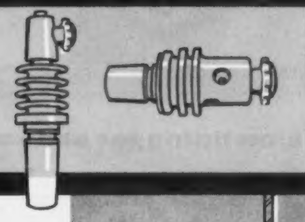
MORE FOR YOUR MONEY IN MECHANICAL FEATURES:



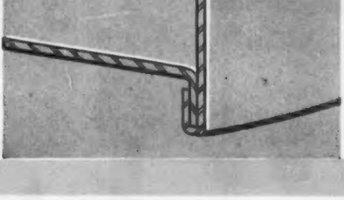
SHUR-SEAL CLAMPING RING

Holds cover to the tank with an airtight seal . . . no atmospheric moisture or dust particles can get inside to contaminate the oil and shorten transformer life. No oil can leak out during shipping or handling. Cover may be removed by loosening a single bolt.

LONG LASTING TANK FINISH. A new formula anti-corrosive paint, carefully applied and thoroughly cured, provides a "Sure Seal" finish that withstands all temperature changes—is much longer lasting in corrosive atmospheres.



SAFETY KEYED BUSHINGS. Heavy wet-process porcelain high-voltage bushings are safety-keyed. All terminals are key-locked in the tank wall. Hand tightening terminals are easily hooked up without tools. All bushings are suitable for use with either aluminum or copper conductor.



ROLLED-UNDER BASES

This new base design provides extra strength . . . better moisture drainage. Serves as an additional safeguard against leakage of oil from the tank. It lessons the chance for finish damage due to scraping.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

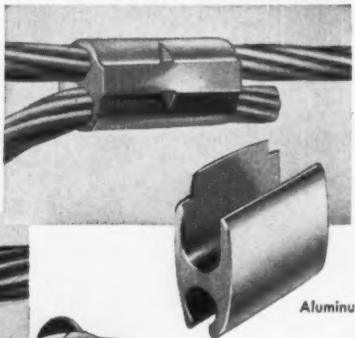
Wagner Electric Corporation

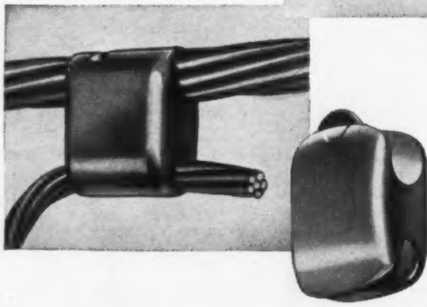
6456 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

WT60-2

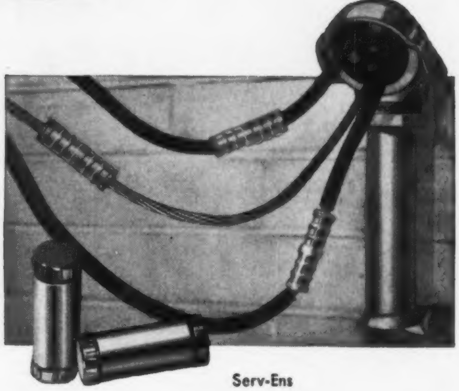
KEARNEY

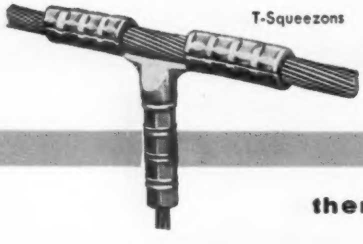
today's ~~tomorrow~~'s loads demand


Aluminum Squeezons


Copper Squeezons

Tension Splicing Sleeves
and Jumper Sleeves


Serv-Ens

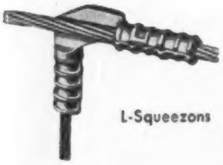

T-Squeezons

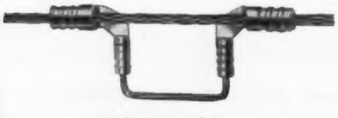
there's a KEARNEY compression fitting for almost every

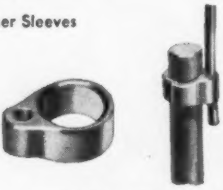
Insulated Splices

Bolted Jumper Sleeves

Compression Terminals


L-Squeezons


L-Squeezon Stirrups


Ground Rod Fittings

Ground Lugs

**for better construction - safer maintenance
- specify KEARNEY products**

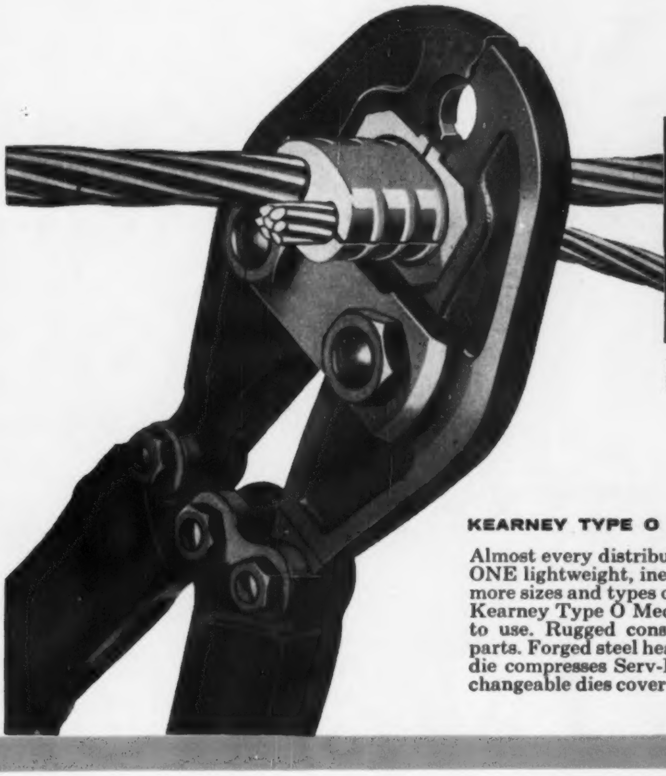
KEARNEY compression fittings

Solve distribution system connection problems with Kearney Compression Fittings . . . get lasting, dependable connection performance under the most rugged operating conditions. Kearney Compression Fittings assure uniformly correct contact pressure, eliminate burndowns and insure extra-long connection life in severely contaminated atmosphere. They prevent contact surface corrosion, eliminate loose or unreliable connections . . . reduce costs. Consider the advantages and economy of Kearney Compression Fittings; write or ask our field representative for more information.

Kearney WH-1 Hydraulic Tool

Fast . . . powerful . . . easy to use. From wide open dies to full compression in less than 20 strokes. Twist of the wrist retracts die or sets tool to make compression. Narrow head for full visibility of work area. Balanced weight for easy positioning. Interchangeable handles available for hot line work.

...applied with KEARNEY compression tools

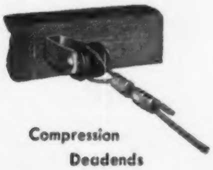


Dies may be easily snapped in or out with fingers only

KEARNEY TYPE O MECHANICAL TOOL

Almost every distribution connection can be made with this ONE lightweight, inexpensive tool. In addition to installing more sizes and types of fittings than tools with fixed dies, the Kearney Type O Mechanical Tool is faster, easier and safer to use. Rugged construction throughout—no complicated parts. Forged steel head, heat treated for high strength. Nose die compresses Serv-Ens and L-Squeezons. Fourteen interchangeable dies cover a wide range of connection fitting jobs.

connection requirement



Compression Deadends

Serv-En Adapters

these 3 easy steps insure trouble-free electrical connections:

1.

2.

3.

1. Use Kearney Conductor Cleaning Brush to remove corrosion.
2. Apply Kearnalex to aluminum contact surfaces immediately after cleaning to exclude air and moisture . . . maintain maximum efficiency contacts.
3. Seal the connection against moisture and contaminants with Kearney Airseal.

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue • St. Louis 10, Missouri

Plants at: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH AND CLARINDA, IOWA • GUELPH, ONTARIO, CANADA

Armorlokt Cables are easy to install around bends or obstructions, readily accessible for repairs and are available for indoor and outdoor applications.

USS
TIGER BRAND
ELECTRICAL WIRE AND CABLE

USS Tiger Brand Electrical Wire & Cable

A standard cable for every special job

- Asbestos Wire and Cable
- Mold-Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

What's the difference in electrical cable?

You can install USS Armorlokt in half the time—at half the cost

Take a close look at the main illustration. With Tiger Brand Armorlokt Interlocked Cable, it's a simple job to run power and light lines around a steel beam. We know, from experience on other jobs, that a conduit system would require about twice as much time to install. It would probably have required larger size cable, because of the higher voltage drop . . . *and it would cost about twice as much!*

Greater current-carrying capacity. For a given conductor size, Armorlokt will have a higher current capacity than three single conductor cables pulled into a steel conduit. As an example, 500 MCM 3-conductor varnished cambric cable with galvanized steel interlocking armor will have a current-carrying capacity of 417 amperes with a copper temperature of 85°C. Three single conductors of the same size in a steel conduit will have a current-carrying capacity of 380 amperes. Putting it another way, 350 MCM Armorlokt might serve, where 500 MCM would otherwise be required in conduit . . . a big saving in favor of Armorlokt.

Less material—less space. With Armorlokt, costly pipe fitting, bending and pull boxes are eliminated. Installation time is cut approximately in half. Space savings as high as 55% to 75% over conduit are common.

Greater layout flexibility. When distribution systems are laid out with easily-accessible, readily-traceable Armorlokt Cables, it is a simple matter to change machinery locations. This might well be a deciding factor in industrial plants.

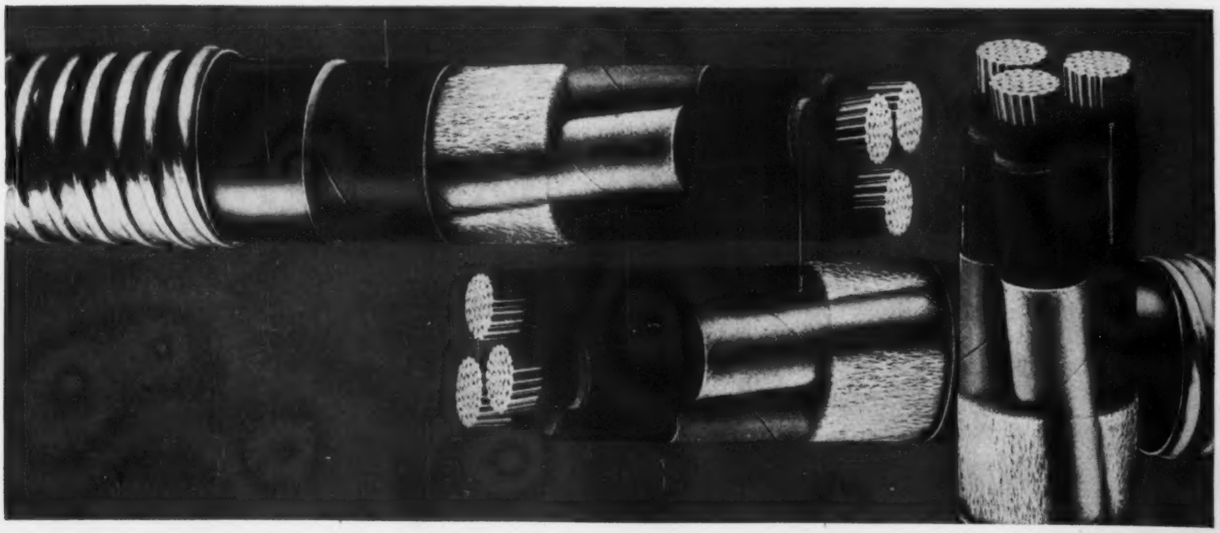
Ease of maintenance. Armorlokt Cable permits the greatest possible ease of maintenance. Cable faults are readily located and serviced. If Armorlokt should become damaged, you simply insert a splice box.

USS Tiger Brand Armorlokt Cable is available in voltage ratings from 110 to 15,000 . . . with galvanized, stainless steel, aluminum or bronze armor . . . with polyvinyl chloride jackets over the armor for especially corrosive applications. For complete facts, write American Steel & Wire, Dept. 0165, 614 Superior Avenue, N.W., Cleveland 13, Ohio.

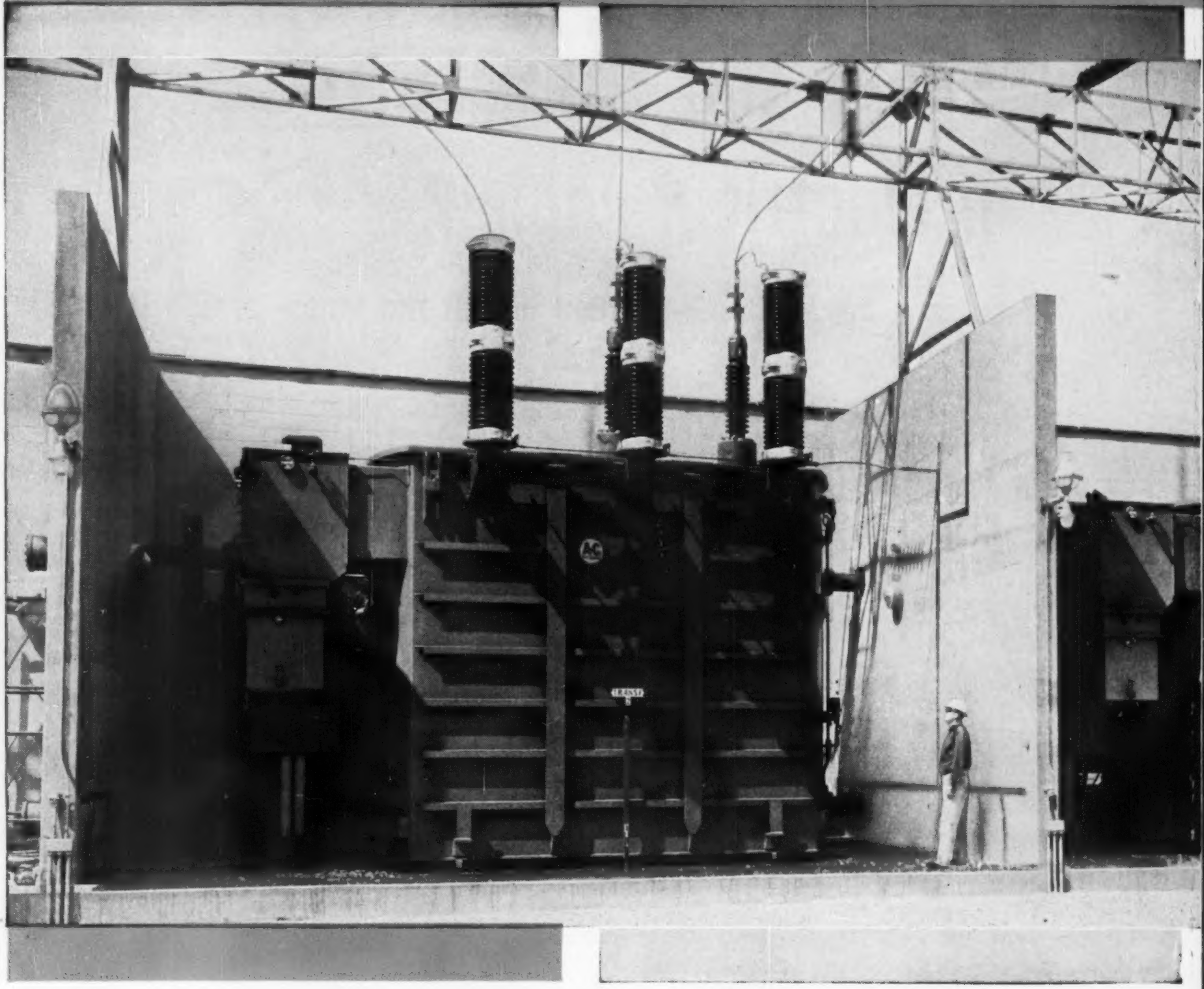
USS, Tiger Brand and Armorlokt are registered trademarks

American Steel & Wire
Division of
United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad



ALLIS-CHALMERS . . . Pacing

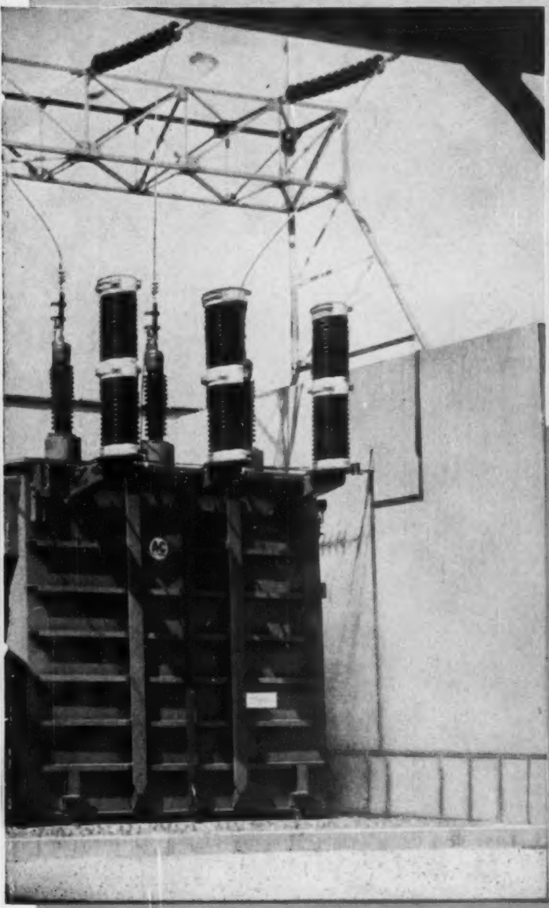


AT WISCONSIN ELECTRIC POWER COMPANY

Dual cooling takes the heat off emergency loads

Patented

Power Progress



Plan to stay ahead... MODERNIZE!

Manual shutoff valves serving transformer cooling equipment piping are opened when dual cooling is necessary. A transformer can be taken from service without draining the oil from the unit or its piping.

A-1155-E

Either of two 90-mva transformers is capable of carrying 2/3 of the combined capacity by using the "dual-cooled" feature

Wisconsin Electric Power Company counts on *designed-in* power transformer emergency capacity. Exclusive *dual-cooled* arrangement* uprates either one of the 90-mva transformers to 120 mva if the other is removed from the line.

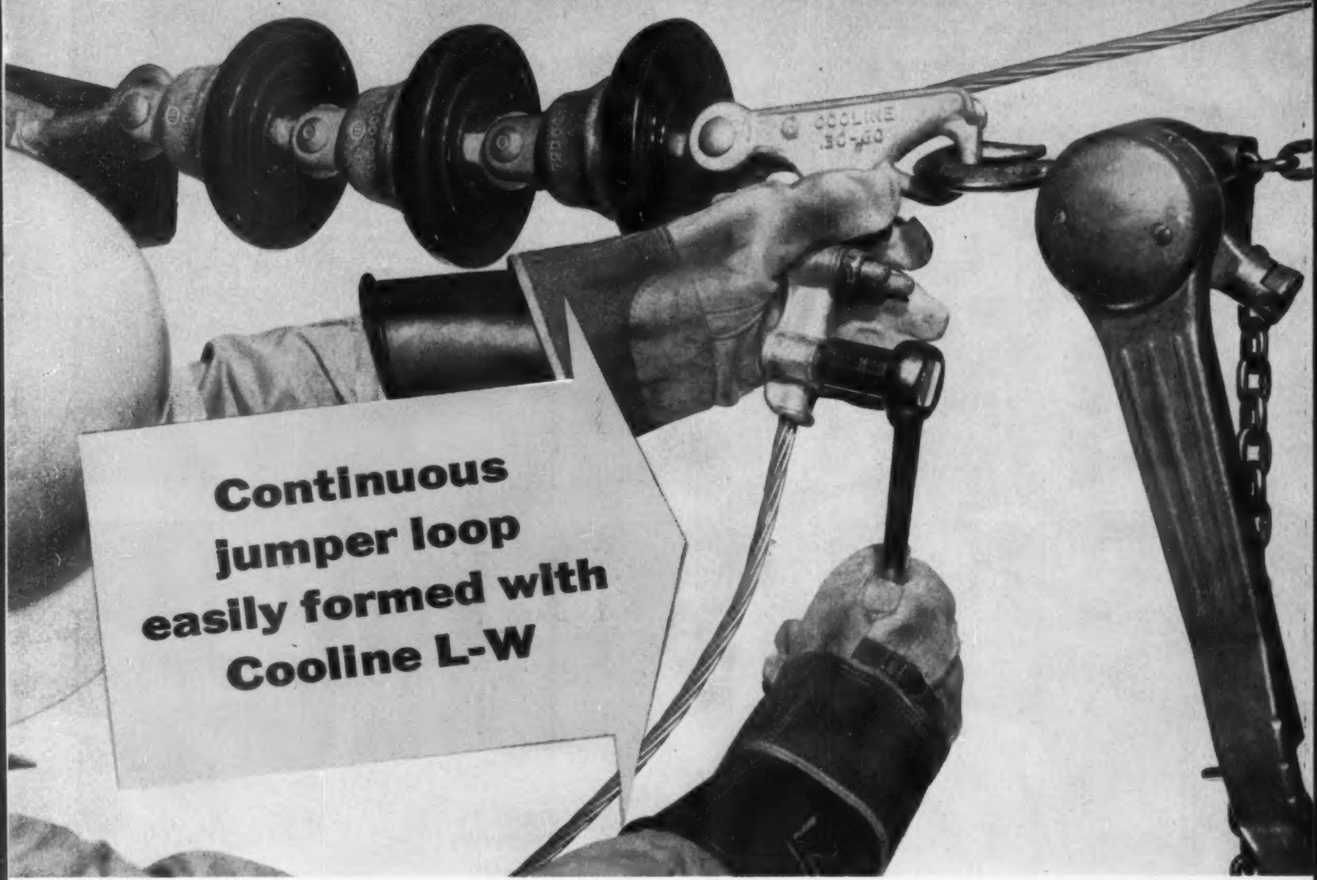
The active transformer utilizes all of the other unit's oil-to-air cooling equipment to dissipate heat. In normal operation, each transformer uses its own coolers independently.

Stepping down 138,000 volts to 13,800 volts, the transformer bank employs accordion-type expansion joints between transformers. Header pipes allow for manual cutoff. The installation has been designed to permit adding a third transformer should demand require it.

Dual cooling is but one of many A-C advantages resulting from continuing transformer research. Others include corona-free design, quiet operation, reduced size and weight, high short-circuit strength. A call to your A-C man will bring further dual-cooling power transformer details.

ALLIS-CHALMERS A-C *POWER FOR THE FUTURE*

Don't Splice It...Loop It



Continuous jumper loop easily formed with Cooline L-W

When Cooline L-W clamps are used on distribution deadends, trouble-free jumper loops can be formed quickly, efficiently without cutting or splicing the conductor.

Low-cost Cooline L-W clamps offer many of the advantages of heavy duty Cooline clamps for transmission lines, but are especially designed for the distribution and sub-transmission trend toward larger conductors and shorter spans.

The L-W clamp has a powerful snubbing action which has high holding power without crushing the conductor. The six models in the series cover a range from .2 to 1.3 inches in conductor diameter with more than adequate ultimate strengths.

Installation is simple since no special tools or skills are required. A few minutes with a standard wrench and Cooline L-W clamps are ready to serve the life of the line.

Just look at these many advantages: design that permits the use of continuous jumper loop without splicing conductor . . . convenience . . . high, maintained holding power . . . low installed cost. And the aluminum construction minimizes electrical losses and conductor heating.

It's certainly worth your time to investigate the many advantages of Cooline L-W clamps now.

OHIO BRASS COMPANY, MANSFIELD, OHIO

GraybaR Since 1869 REG U.S. PAT OFF
This product distributed by GraybaR ELECTRIC COMPANY

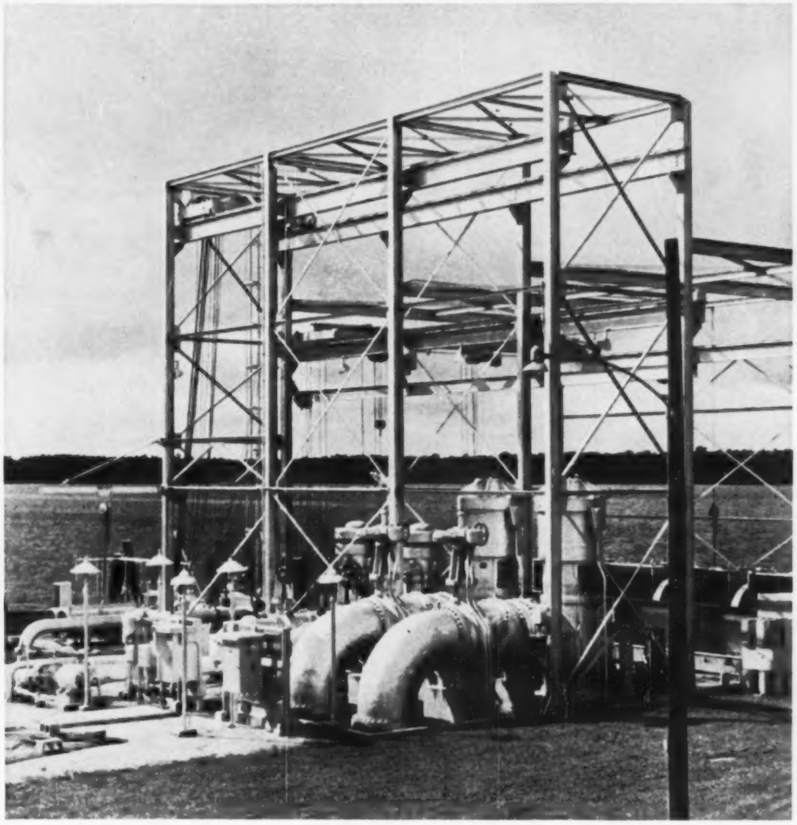
Ohio Brass HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

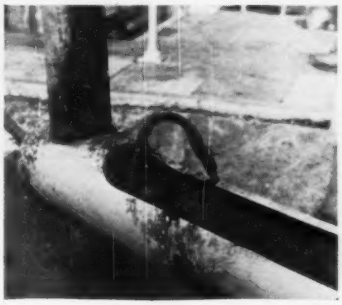
10038-H

News about

B.F.Goodrich Chemical *raw materials*



Florida Power & Light Company uses anode racks made of Geon vinyl pipe. Fabricated by F P & L plant personnel at this job. B.F.Goodrich Chemical Company supplies the rigid Geon vinyl. These photos show intake structure at Palatka plant on St. John River, one of many places anode racks of Geon are used.



FP&L fights underwater corrosion with anode racks of rigid GEON

Underwater steel structures corrode when they are attacked by galvanic currents. Florida Power & Light engineers solve the problem two ways. They reduce effect of galvanic currents with an opposing voltage and they suspend anodes of graphite to bear the brunt of any continuing flow. These anodes rest in frames made of rigid Geon pipe.

Vertical side frames are 2″ Geon pipe and trays are open sections of 5″ pipe. The only effect on the racks of Geon is the marine growth shown in the photo at upper right. This growth is easily washed off, as photo at lower right shows.

Here's another example of the way Geon vinyl can solve corrosion problems for utilities. As pipe, as conduit, or as coatings, you'll find Geon vinyl is often the answer to your corrosion problems. For more information, write Dept. GX-4, B. F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

A TRADE MARK OF B.F.GOODRICH CHEMICAL COMPANY

Geon

VINYLS

A DIVISION OF THE B.F.GOODRICH COMPANY

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

Another Engineering Achievement

NOW SOLID COIN

FROM FEDERAL PACIFIC...NEW HIGH PRESSURE CONTACTS

HIGH PRESSURE CONTACT with no galling action at the contact areas! Federal Pacific's rugged new Air Disconnect Switches use integral, solid coin silver inserts that are harder than the hard-drawn copper. Permits heavy wiping action assuring thorough cleaning, more consistent low contact-resistance, ability to withstand high momentaries. Eliminates corrosion under adverse atmospheric conditions. ANOTHER FEDERAL PACIFIC FIRST. This revolutionary design gives you a complete line of Air Disconnect Switches with longer, maintenance-free life. Eliminates the need for multiple, parallel contacts. Available on TG & YVH group-operated switches. Vertical break types: 7.5—34.5 kv (400, 600, and 1200 amp) and 46—330 kv (600, 1200 and 1600 amp) and center side break types: 46—161 kv (600 and 1200 amp). Over 50 years experience in design and manufacture of power switches for utilities helped bring forth this new development.

SPECIAL LABORATORY TEST APPARATUS designed to study galling phenomena, the first of its type—was created by Federal Pacific to duplicate switch closing action and

SILVER CONTACTS

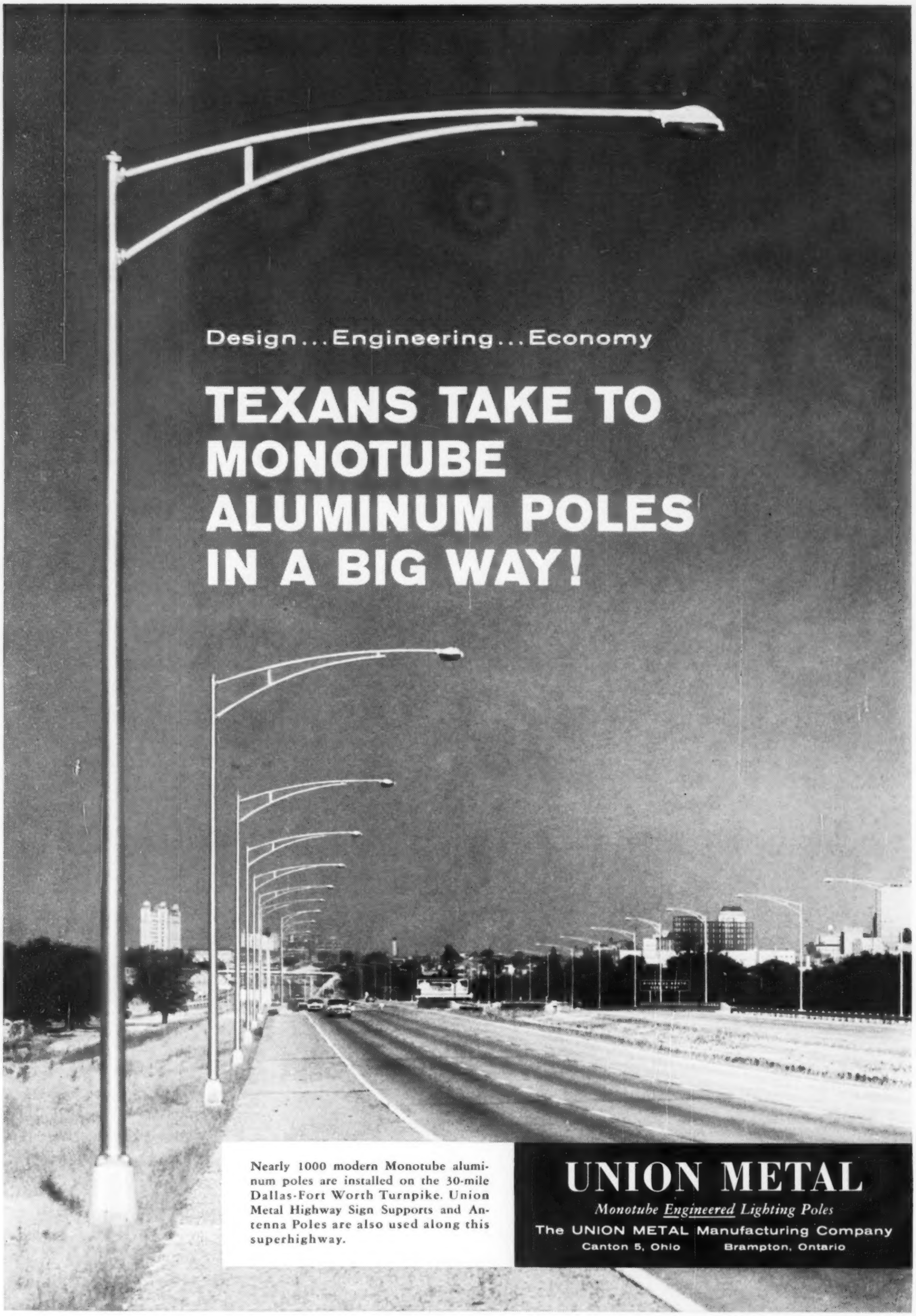
FOR AIR SWITCHES... HARDER THAN HARD-DRAWN COPPER

record variations in coefficient of friction at contact. Result: the first high pressure, maintenance-free solid silver to solid silver contacts that will not gall!

Additional information on the new Federal Pacific Air Disconnect Switches with harder, non-galling, solid coin silver to solid silver contacts may be obtained from your local Federal Pacific Electric Representative, or by writing to Federal Pacific Electric Company, General Offices: Dept. 388, Newark 1, New Jersey—The Best in Electrical Control, Distribution and Power Equipment.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

Affiliated with Cornell-Dubilier Electric Corporation


Design...Engineering...Economy
TEXANS TAKE TO MONOTUBE ALUMINUM POLES IN A BIG WAY!

Nearly 1000 modern Monotube aluminum poles are installed on the 30-mile Dallas-Fort Worth Turnpike. Union Metal Highway Sign Supports and Antenna Poles are also used along this superhighway.

UNION METAL

Monotube Engineered Lighting Poles

The UNION METAL Manufacturing Company
Canton 5, Ohio Brampton, Ontario

I-T-E installations stand up daily to the ravages of —

- the windswept Western deserts
- the freezing Rockies and High Sierras
- the salty Pacific coastline
- the wet forests of the great Northwest

FROM SNOW AND ICE TO SCORCHING SUN...

You'll find field-proven Power Circuit Breakers by I-T-E

For more than 50 years, Kelman power circuit breakers have proved themselves the hard way—successfully standing up under the most rugged environments. Under all kinds of adverse conditions, from snow and ice to desert sand and sun, from whipping rains to fast-changing mountain temperatures, thousands of Kelman breakers have weathered the years and stood the test of time.

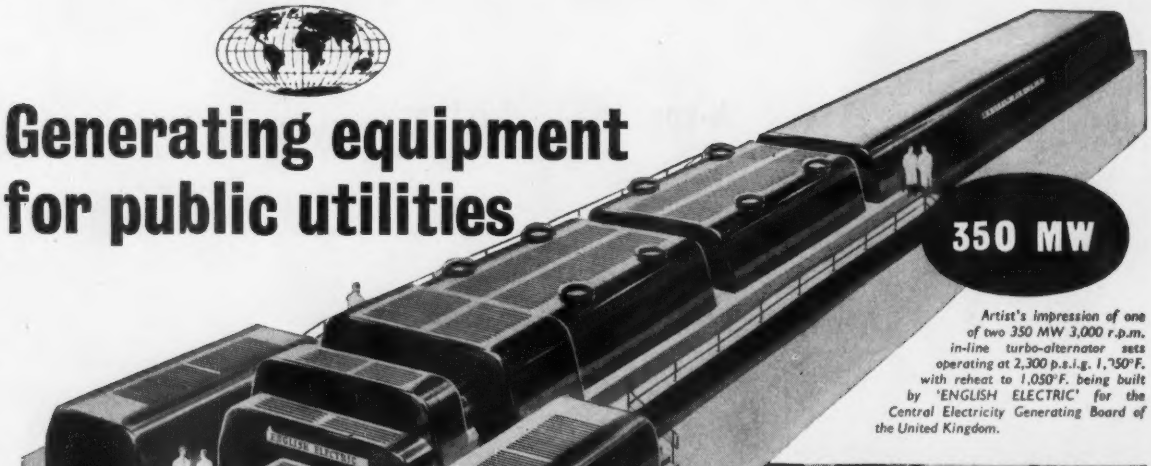
Now part of I-T-E's broad line of established electrical equipment, the latest improved oil breakers from the Power Circuit Breaker Division are offered nationally through all I-T-E sales offices. Available in transmission, subtransmission, and distribution ratings, these breakers stand ready to serve under any conditions anywhere in the United States.

For descriptive literature on I-T-E's field-proven power circuit breakers, write to 1667 North Main Street, Los Angeles 12, Calif., Dept. EWO-961-1.

I-T-E

I-T-E CIRCUIT BREAKER COMPANY
KELMAN POWER CIRCUIT BREAKER DIVISION

Generating equipment for public utilities



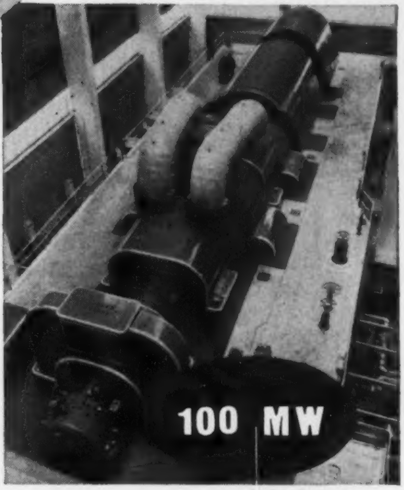
Artist's impression of one of two 350 MW 3,000 r.p.m. in-line turbo-alternator sets operating at 2,300 p.s.i.g. 1,050°F. with reheat to 1,050°F. being built by 'ENGLISH ELECTRIC' for the Central Electricity Generating Board of the United Kingdom.

or for industry

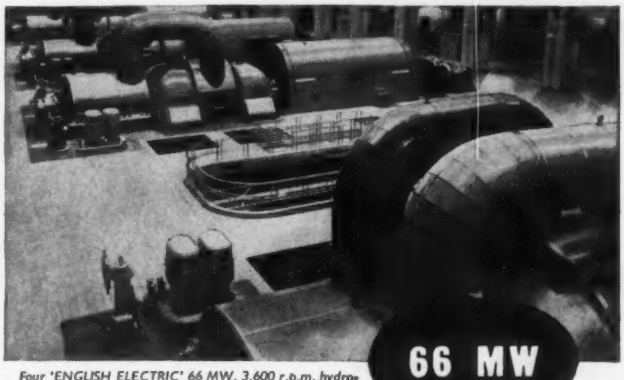
'English Electric' steam turbo-alternator sets and auxiliary equipment have been installed by public utilities and industry throughout the world.

Backed by over 55 years experience, 'English Electric' are today manufacturing sets amongst the largest in the world, including two 350 MW units, two 275 units and five 200 MW units for the Central Electricity Generating Board of the United Kingdom as well as many small output industrial units.

'English Electric' products cover all aspects of the generation, transmission and utilization of electric power. Contracts have been completed and others are in hand for many major American power projects.



One of four 'ENGLISH ELECTRIC' 100 MW 3,000 r.p.m. turbo-alternator sets installed in Willington Power Station, England. These hydrogen-cooled turbo-alternator sets operate with steam at 1500 p.s.i.g. 1,050°F.



Four 'ENGLISH ELECTRIC' 66 MW, 3,600 r.p.m. hydrogen-cooled turbo-alternator sets were installed between 1951 and 1953 at the Windsor Power Station of the Hydro-Electric Power Commission of Ontario.

'ENGLISH ELECTRIC'

Agents: ENGLISH ELECTRIC Export & Trading Co. Ltd., 750 Third Avenue, New York 17, N.Y. Telephone: Murray Hill 7-0303

Sub Agents:—

James I. Metcalf & Co. Inc., Room 704, 1411 Fourth Avenue Building, Seattle 4, Washington. Branch offices in San Francisco, Los Angeles, Portland, Phoenix, for Alaska, Arizona, California, Idaho, Montana, Nebraska, Nevada, Oregon, Utah, Washington, Wyoming.
Osgood & Associates, Inc., 988 Spring St., N.W., P.O. Box 7383, Station C, Atlanta 9, Ga. for Alabama, Florida, Georgia, Kentucky, South Carolina and Tennessee.
Electron Equipment Co. Inc., 2418 Calhoun St., New Orleans, 18, La. for Louisiana and Mississippi.
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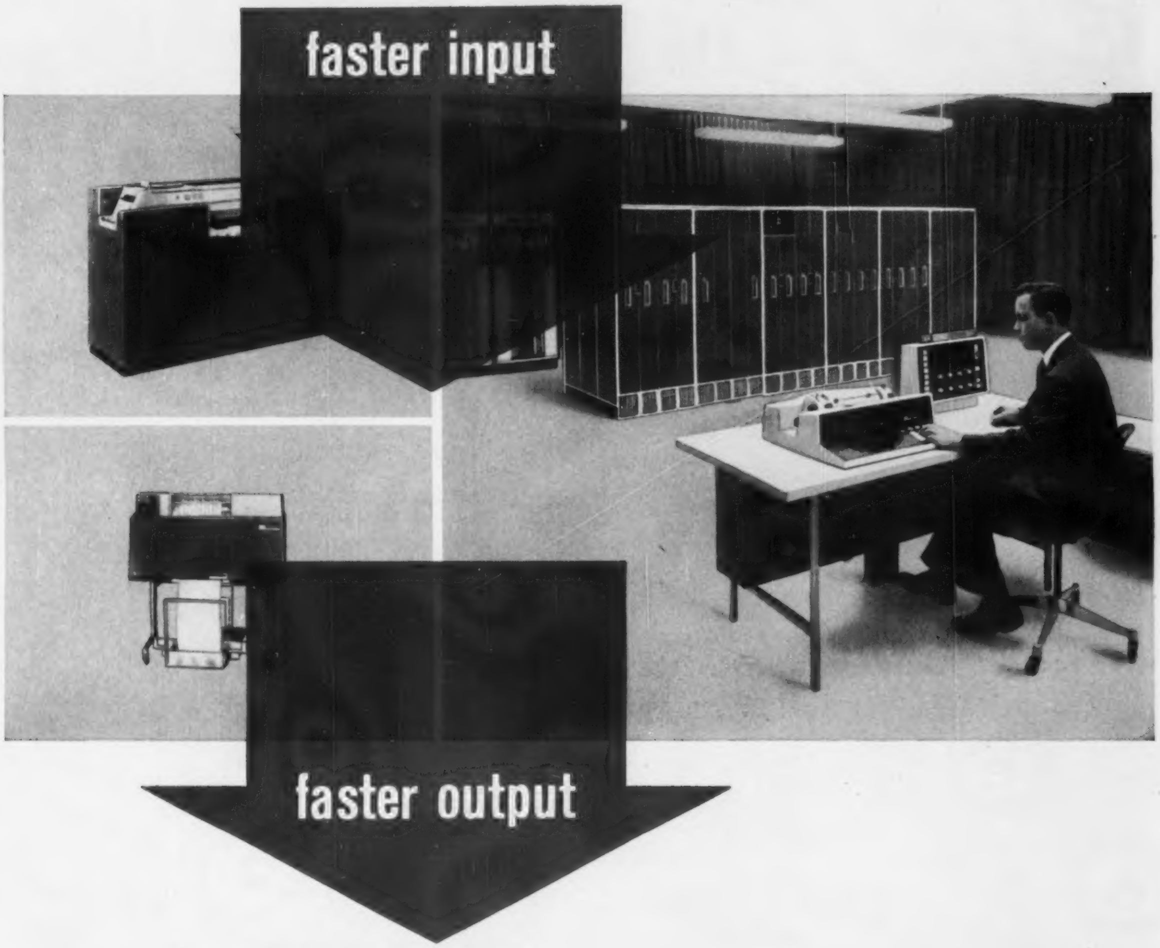
SERVICE FACILITIES ARE AVAILABLE THROUGH THREE LARGE CANADIAN PLANTS

OC/US.4A

with IBM's new, high-speed 1401 System for



...the powerful IBM 7070 now packs even greater processing power

Greater flexibility in putting your problem on computer . . . greater speed in taking results off . . . greater flexibility in handling peripheral operations—these are the features that IBM's exciting new 1401 System brings to the IBM 7070. The 1401 balances input/output speeds to match the tremendous processing speed of the 7070, adds powerful off-line editing and programming facilities to free the computer for more profitable work. The total system—designated the tape-oriented IBM 7070—gives you lower job cost . . . more production per dollar.

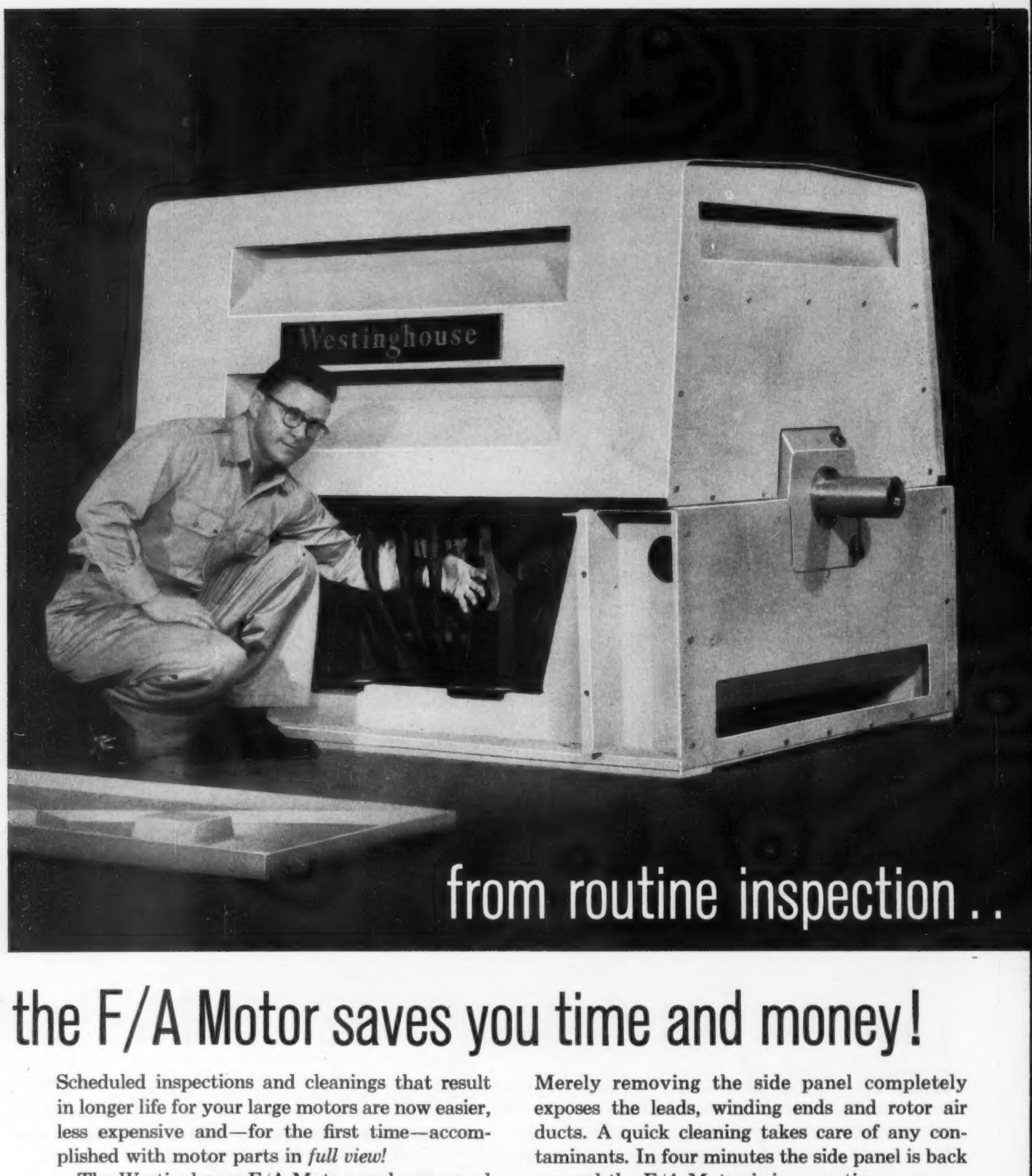
The tape-oriented 7070 employs the 1401 System to boost card-to-tape conversion from 500 to 800 cards a minute. The 1401 also features an exclusive horizontal chain printer that turns out crisp, perfectly aligned copy at 600 lines a minute. This unique printer moves paper at magnetic tape speeds—up to three and a half times faster than conventional printers!

With these advances comes unusual flexibility. The tape-oriented IBM 7070 is a solid state, high-capacity system. It can be expanded from a single-channel 4-tape to a four-channel 40-tape system. It can read on one to four channels simultaneously with computing. And in keeping with IBM's concept of Balanced Data Processing, the 7070 is linked with comprehensive services ranging from personnel education and program planning through reliable service engineering.

For full information on the new tape-oriented 7070 call your IBM representative. Like all IBM equipment, the 7070 System may be either purchased or leased.

IBM®

BALANCED DATA PROCESSING



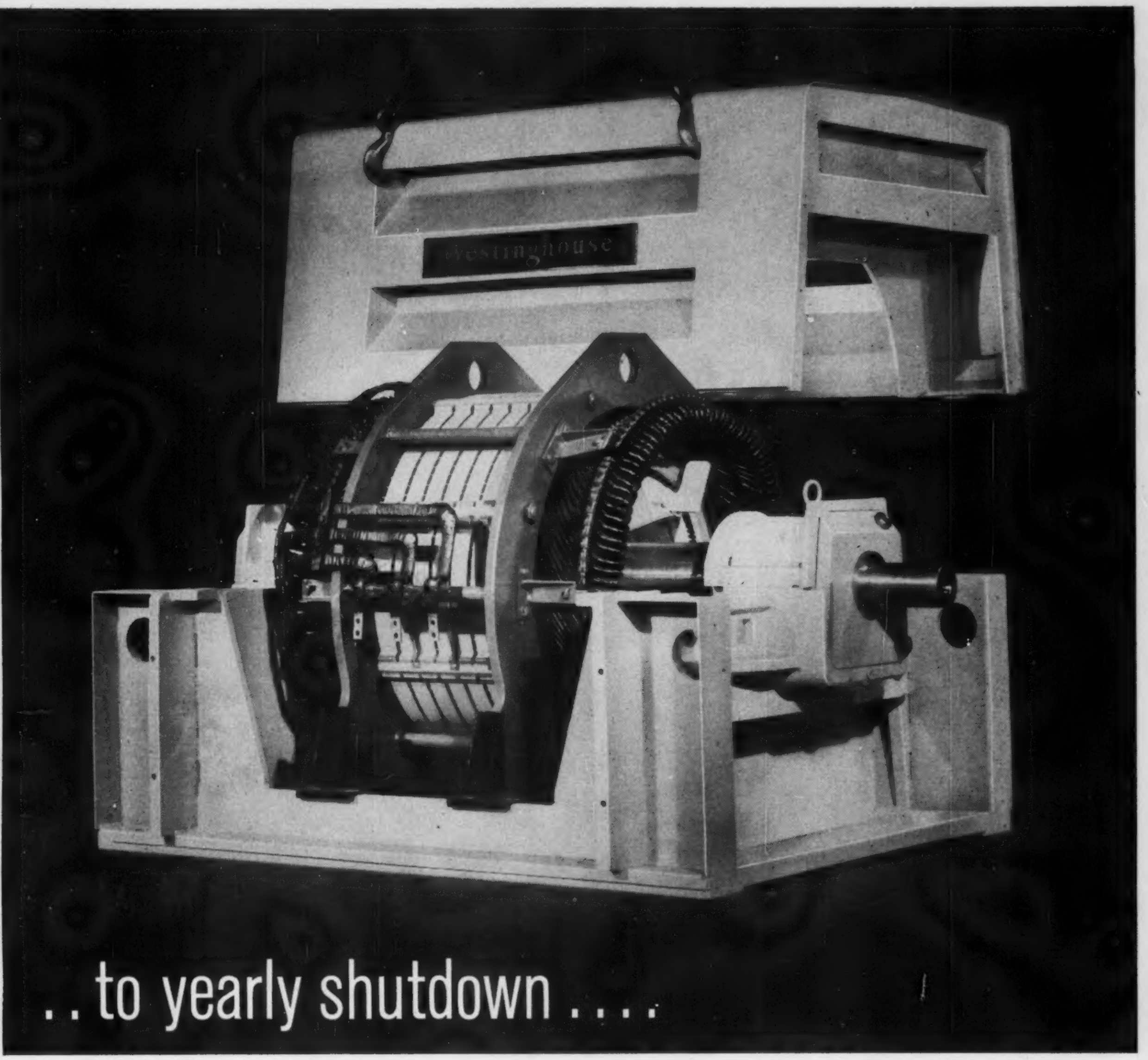
the F/A Motor saves you time and money!

Scheduled inspections and cleanings that result in longer life for your large motors are now easier, less expensive and—for the first time—accomplished with motor parts in *full view!*

The Westinghouse F/A Motor can be prepared for routine inspection, examined, and be back in operation in 10 minutes. For planned yearly inspections, complete disassembly and reassembly take only an hour.

Routine or Weekly Inspection. It takes just three minutes to prepare for this inspection. Merely removing the side panel completely exposes the leads, winding ends and rotor air ducts. A quick cleaning takes care of any contaminants. In four minutes the side panel is back on, and the F/A Motor is in operation.

Detailed Annual Inspection. Such a complete disassembly as is shown at the right, above, is rarely done, because in conventional motors it is virtually impossible. However, with the Westinghouse F/A Motor it *can* be done, and in just half an hour! No other housing design permits such



see-ability and accessibility. Here you can *completely* check windings and bracing, examine the ends of the rotor, check the condition of the *total* core and check all bolts for security. Necessary cleaning can be done in minutes, and with a thoroughness heretofore impossible. Then, in roughly 30 minutes, reassembly of side panels, top air shields, end covers and top enclosure puts the F/A Motor back "on the line."

For full information on the long service life, reliability and accessibility of the Westinghouse F/A Motor, call your Westinghouse representative or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-15003

CHECK THESE BONUS VALUES IN THE F/A MOTOR

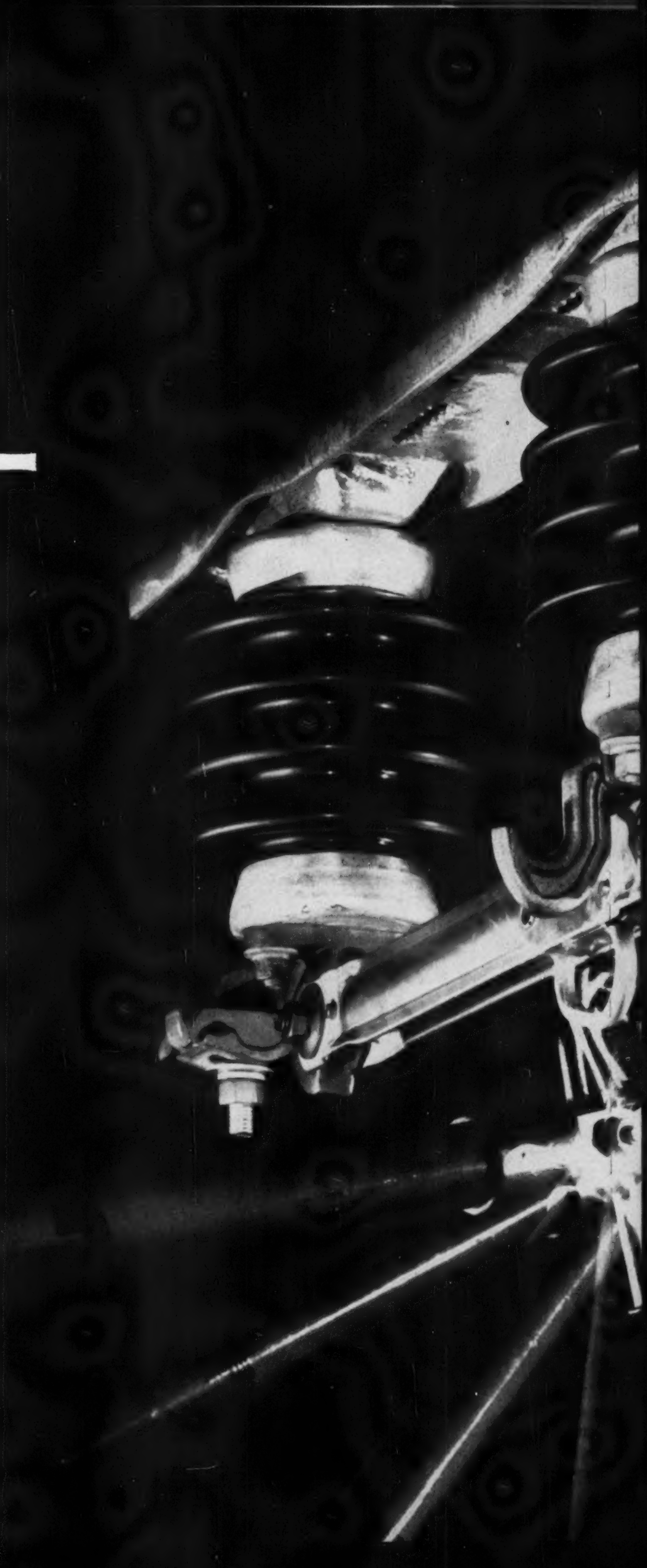
- **Full Accessibility**
- **Inherently Quiet—housing and stator separated**
- **Thermalastic® Insulation—recognized as the finest**
- **Time-Proven Components—longer, more efficient life**
- **Easy Connection—conduit boxes eliminated**

YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS

from ANY ANGLE



1. STURDY INSULATOR. Has 5000 inch-lb. torsion strength. Means it can withstand the most severe twisting stresses when blade is closed from the side.

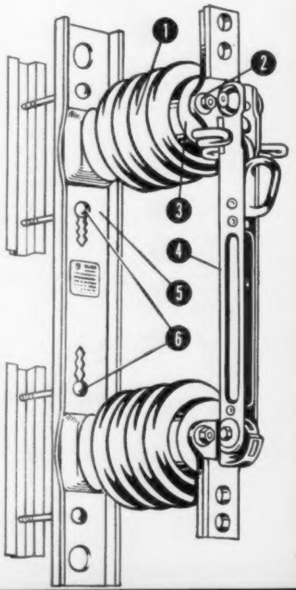
2. TWO-BOLT INSULATORS. Two widely spaced bolts on each insulator cap prevent it and the live parts from rotating.

3. INSULATOR CAPS pressed from 12 gauge steel. Will not yield or deform under load.

4. RIGID BLADE won't bend. Heavy embossing and flaring adds strength and rigidity. Blade guides (which also serve as attachment hooks for LOAD-BUSTER) help steer blade.

5. HUSKY BASE made of 3/16" galvanized steel. Prevents misalignment and extensive distortion when tightening mounting bolts.

6. 4 BOLTS, 2 BACK-UPS for secure, distortion-free mounting on double cross arm.



this S&C Loadbuster Disconnect can be slammed closed without missing

This tough, rugged distribution disconnect won't twist, bend or loosen no matter how hard or from what angle it is slammed shut. To a lineman, who has to close pole mounted disconnects out on a cross arm, this means fast, positive closing. There is no chance of missing the contact or hanging up. Six of the features that help make this possible are pictured at left.

And with LOADBUSTER®, S&C's portable loadbreak tool, and LOADBUSTER DISCONNECTS, you get reliable, low-cost load switching . . . anywhere on your distribution feeders. LOADBUSTER breaks the circuit with no arc, and with no contact burning.

For more information on LOADBUSTER DISCONNECTS please write for Bulletin 721. S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 18, Ont.

S&C ELECTRIC COMPANY

S&C

Industry-proved through a quarter century of service...THERE'S NO DOUBT ABOUT NEOPRENE

Now you can zip through Baltimore at 45-60 mph—even at night. A total of 826 powerful fluorescent lights brighten the roadway, make high-speed driving safer. Neoprene jacketing was specified for over a million feet of illuminating cable used in this installation.

OVER A MILLION FEET OF NEOPRENE-JACKETED CABLE ILLUMINATES BALTIMORE EXPRESSWAY

Tough, pliant, abrasion-resistant neoprene meets Maryland Roads Commission specifications

The Baltimore Harbor Tunnel Expressway—16 miles of limited access dual lane highway—uses over a million feet of illuminating cable . . . and every foot of that cable is jacketed with durable neoprene synthetic rubber. Neoprene-jacketed cable, supplied by Walker Brothers, met specifications set down by the Maryland Roads Commission for lighting cable with a "tough, pliant, abrasive-resisting sheath."

Neoprene jacketing combines toughness and abrasion resistance with many other desirable qualities. It resists weathering, chemicals, temperature extremes and deformation from cable clamps. It has proved—in actual service—that "neoprene jacketing" means long, economical protection for electrical cable. E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Department EW-4, Wilmington 98, Delaware.

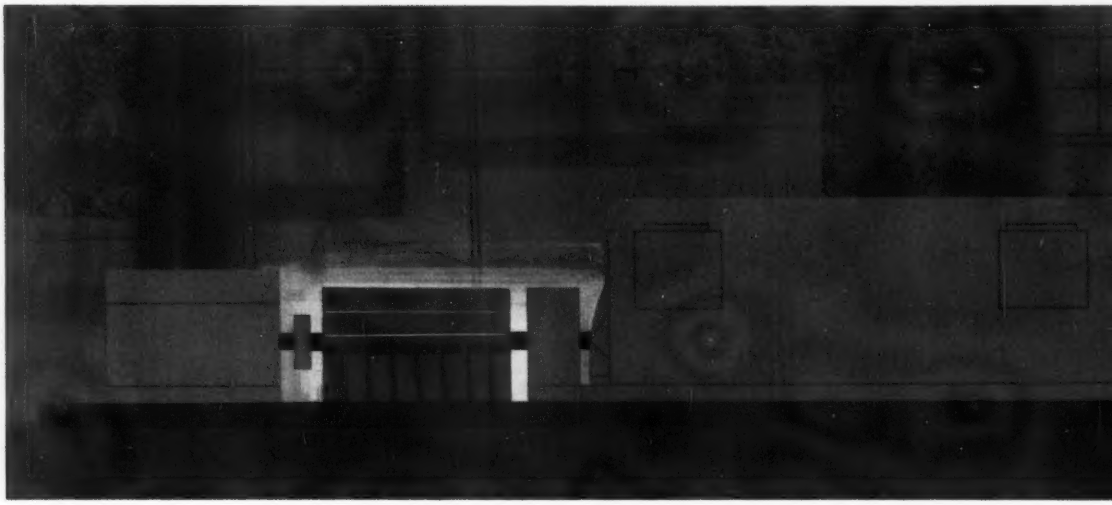
DU PONT
REG. U. S. PAT. OFF.

NEOPRENE
SYNTHETIC RUBBER

Better Things for Better Living . . . *through Chemistry*

American-Standard Industrial Division POWER-LIFT IN ACTION

Gýrol® Fluid Driv
proved record of



On-the-shaft Fluid Drive applications offer multiple savings. In addition to the well-known savings which adjustable speed offers, main shaft driven pumps eliminate costly electrical accessories necessary for motor driven pumps. Auxiliary demands are reduced, so more power can be released to consumer lines.

"On-the-Shaft" Gýrol Fluid Drives
installed, or to be installed,
for the following public utilities:

- **Consolidated Edison of New York, Inc.**
- **Public Service Electric & Gas Co.**
- **Pacific Gas & Electric Co.**
- **Louisiana Power & Light Co.**
- **Southern California Edison Co.**
- **Consumers Power Co.**
- **Commonwealth Edison Co.**

On motor
advantages of
of installation
adjustable spe
over the entire
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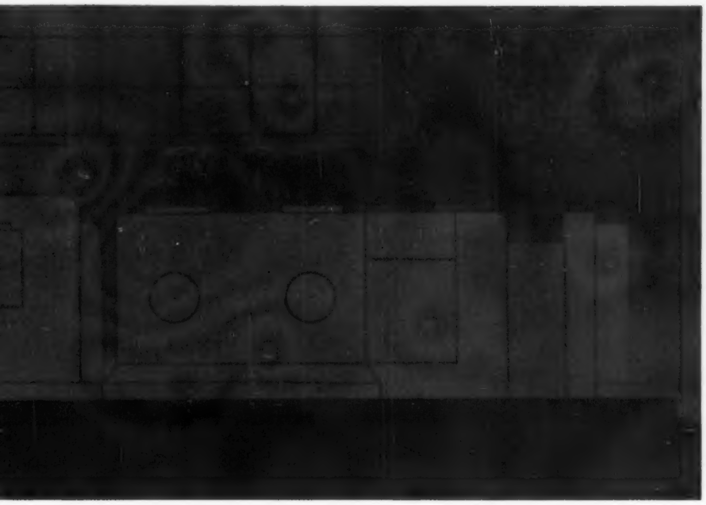
of high press
Fluid Drive p
rating to shu

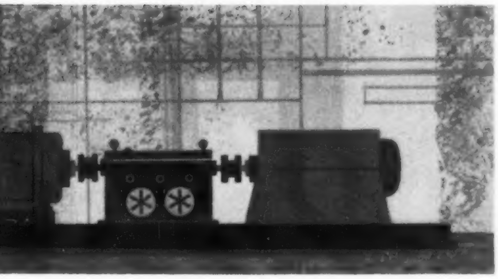
COPYRIGHT 1959, AMERIC

ve offers you a
f field experience and reliability

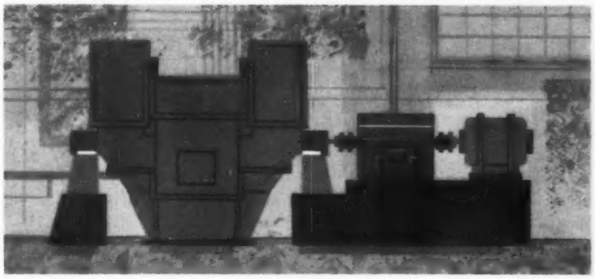


Today more than 4-million horsepower are being driven through Gýrol Fluid Drives in public utilities, industrial power plants, and on industrial machinery of all types. Such widespread acceptance could only come from proved performance in the field.

In power plant applications, not only does Gýrol Fluid Drive's stepless, shockless, adjustable speed pay off in better control, lower maintenance costs and reduced noise levels, but it also provides substantial power savings through lower horsepower requirements.

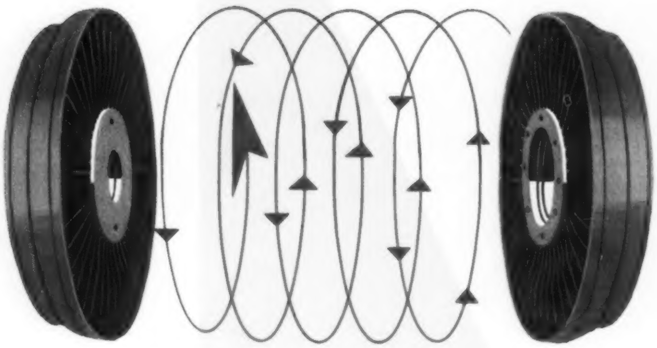


otor driven boiler feed pumps the
es of Fluid Drive have been proved in hundreds
ations over the past 20 years. Through Fluid Drive,
e speed savings in pump horsepower are obtained
entire actual operating range. In many cases elimi-
feed water regulating valves and lower initial costs
pressure heaters, piping and fittings are effected.
ive provides fast, accurate control from full pump
shutoff. Operators like this full-range flexibility.



Fluid Drive on Mechanical Draft Fans. Present day boilers are demanding larger fans requiring higher horsepower and higher speed motors. Problems of high fan WR^2 starting, of fan noise and of fan control are of increasing concern. Fluid Drive provides a better means of driving and controlling today's mechanical draft fans. Fluid Drive can divorce fan from motor for starting. Through adjustable speed Fluid Drive can lower fan noise, reduce fan wear, and save fan horsepower.

AMERICAN RADIATOR & STANDARD SANITARY CORPORATION



New from American-Standard
Industrial Division

Power-Lift[†] for Power Plants

cuts auxiliary demand with Gýrol® Fluid Drive

Power-Lift is a timely new concept of coordinated products and services from American-Standard Industrial Division. Its purpose is to help you raise overall efficiency in your plant by offering *products* that are proved in the field and designed, engineered, and manufactured to a uniform standard of quality and performance . . . with *service* by product specialists in every principal city.

← **LIFT THE FLAP** *and see how Gýrol Fluid Drives provide cost-saving benefits for fans and boiler feed pumps . . .*

[†] Service-mark of American-Standard

As Near as Your Phone

American-Standard Industrial Division
Power-Lift Products and Services

Talk over your requirements with an American-Standard* Industrial Division product specialist. You'll find him well prepared and experienced—frequently able to base equipment recommendations upon precedents of proved success. And, in many instances, our comprehensive standardization paves the way to savings in time and cost. Offices in all principal cities. AMERICAN-STANDARD INDUSTRIAL DIVISION, DETROIT 32, MICHIGAN. IN CANADA: AMERICAN-STANDARD PRODUCTS (CANADA) LIMITED, TORONTO, ONTARIO. EXPORT DIVISION, AMERICAN-STANDARD, NEW YORK CITY.

SURFACE CONDENSERS

Designed to service the largest of today's and tomorrow's steam turbines. Low bundle entrance velocity; liberal steam transportation lanes; moisture impingement grids to extend tube life; expansion diaphragms; effective de-aeration and many other features created during 40 years of surface condenser development and research.

MECHANICAL DRAFT FANS

Complete range of sizes and types for forced draft, induced draft, gas recirculating, and primary air fan applications. Designed to meet rigid requirements of modern power plants where maximum pounds of steam are produced daily at peak efficiency. Airfoil, forward curved, backwardly inclined, radial, radial tip blades.

FEEDWATER HEATERS

Design incorporates unique new High Pressure closure. Maintenance is simplified with only four major parts. Exceptionally high safety factor built into all units—more than double ASME Code requirements. Temperature stresses from start-ups or load changes virtually non-existent.

HEAT EXCHANGERS

Designed and built with thoroughness and precision. Standard or specially engineered units for virtually all conditions and applications, including high pressure-high temperature exchangers, compressor inter- and after-coolers, fuel oil heaters, blow-down exchangers, and many others.

GYROL® FLUID DRIVE

Provides stepless adjustable speed control for fans and boiler feed pumps. Performance, power savings, and reliability proved in the field. Units for motor driven boiler feed pumps or for "on-the-shaft" duty on main turbine generator. Drives are available for fan and pump duties for all boiler sizes.

DUST AND FLY ASH COLLECTORS

Type "D" Dust Collector: mechanical "cyclone-type" collector. Series 342 Dust Collector: uses "cyclone" principle, with individual tubes which permit flexibility in design to fit plant layout. Series 361 Dust Collector: combines primary and secondary systems for high efficiency fly ash recovery.

*American-Standard and Standard® are trademarks of American Radiator & Standard Sanitary Corporation.

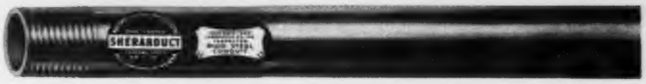
AMERICAN-Standard
INDUSTRIAL DIVISION

AMERICAN BLOWER PRODUCTS • ROSS PRODUCTS • KEWANEE PRODUCTS

GET YOUR CONDUIT FROM NATIONAL ELECTRIC

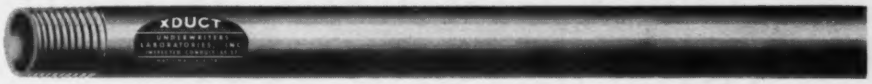
4 BASIC TYPES READILY AVAILABLE IN ALL STANDARD SIZES

SHERARDUCT



Hot-dip galvanizing cannot equal Sherarduct, which is coated with the MVC-1 formula. It's virtually impervious to corrosion, and a special process normalizes the metal to permit *easy bending with no peeling or flaking*.

XDUCT



A superior bright steel conduit with galvanized threads. Outside surface has a coating of electrolytically pure zinc to increase resistance to both corrosion and flaking. Clear hard enamel interior makes fishing easy.

NE ALUMINUM

NE
NE ALUMINUM R C

National's aluminum conduit is an easily installed, corrosion resistant conduit with a permanent attractive appearance. Color-coded thread protectors provide complete thread protection as well as ease in storing and selecting sizes.

EMT

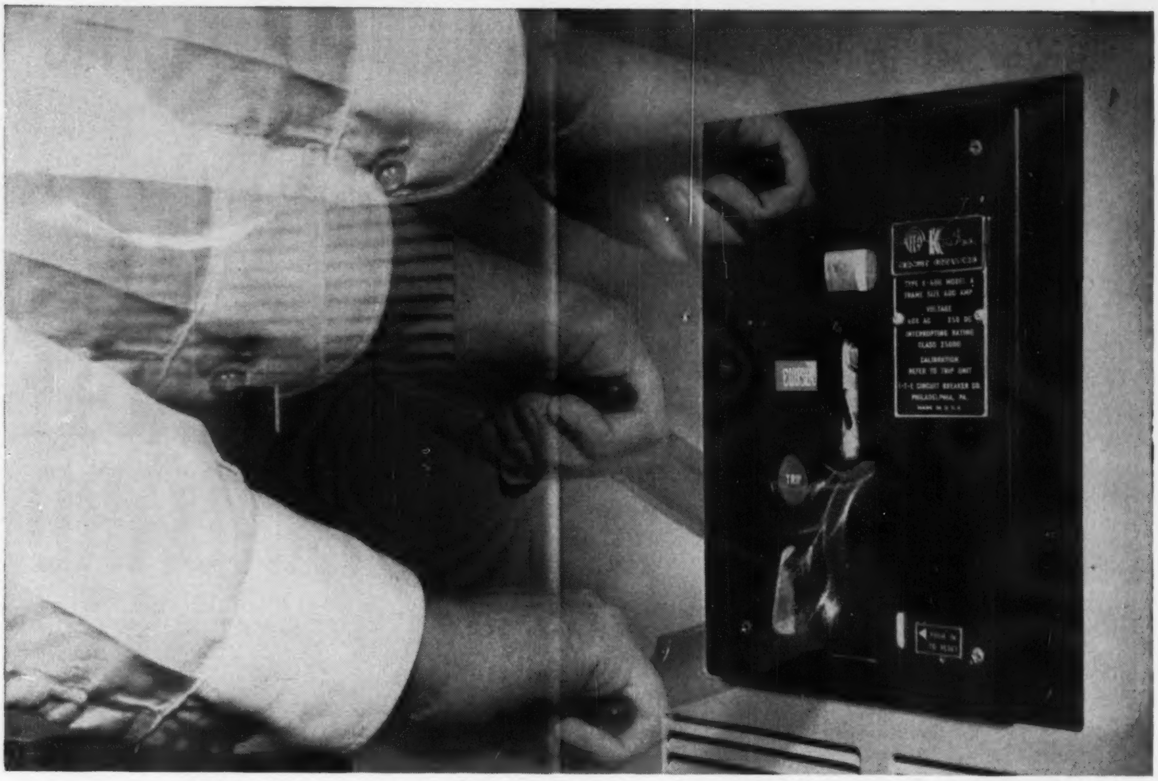
EMT
XDUCT JUNIOR

EMT XDUCT Jr. Electrogalvanized exterior with a special formula silicone base clear enamel on the interior to facilitate fishing. Will not flatten, bends readily into the job.

Also available are electrically approved Wrought Iron Conduit, Black Enamel Conduit and Flexsteel, (flexible steel conduit) . . . For additional information write to: *National Electric Division, H. K. Porter Company, Inc., Porter Building, Pittsburgh 19, Pa.*

NATIONAL ELECTRIC DIVISION **PORTER** ***H. K. PORTER COMPANY, INC.***

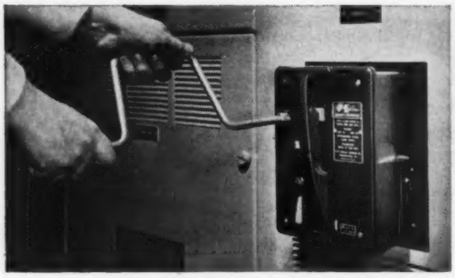
PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.



I-T-E started a revolution in 1957 when it introduced the completely new K-Line circuit breaker with stored energy closing. Today it is still the most advanced circuit breaker for low voltage switchgear you can buy.

ONLY I-T-E 600 V. SWITCHGEAR GOES BEYOND STORED ENERGY

GIVES YOU ADVANCES NO OTHER GEAR OFFERS



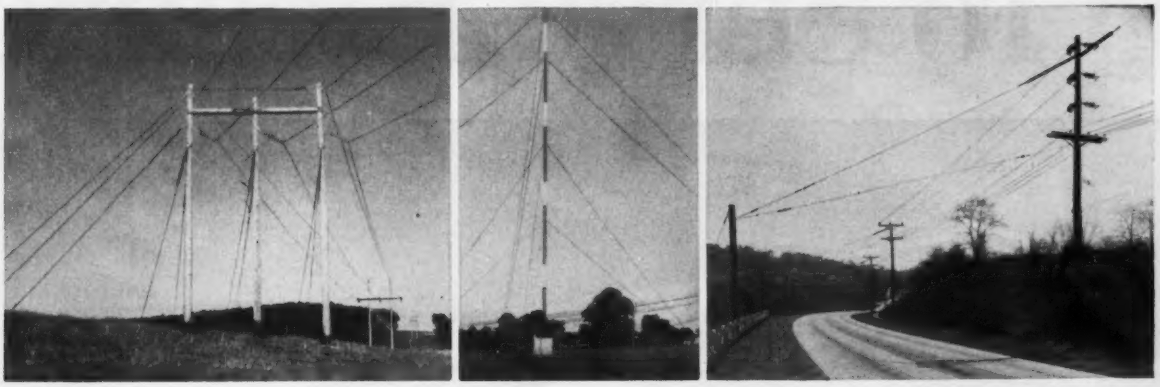
Closed door disconnect. A real safety feature. Operator can rack breaker out to either test or disconnect position without opening door. Prevents cluttered aisles from open doors and protruding breakers. And keeps breakers clean when they are disconnected.

Expanded range trip. I-T-E breakers can grow with your loads. Each trip device has roughly three to four times the range of conventional devices. Saves cost and downtime that replacement would demand. Easy to adjust. Calibrated directly in amperes.

You pay no more. That's right. With all these extra advances I-T-E low voltage switchgear costs no more. Send for detailed descriptive Bulletin 6004-C. I-T-E Circuit Breaker Company, Dept. SW, 1900 Hamilton St., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

Today's best buy for all guying purposes...



Copperweld® TYPE M™ GUY STRAND

...requires no maintenance

...matches pole life

Install Copperweld Type M Guy Strand on your lines. It's a low-cost, money-saving way to rid yourself, once and for all, of the trouble and expense that result when guys weaken or fail because they haven't got what it takes to resist corrosion.

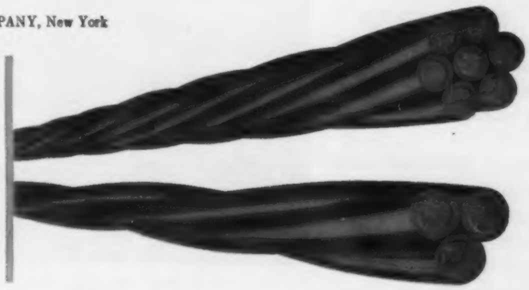
Type M Strand resists corrosion. You can put it up and forget it. Each wire is permanently protected against rust by a thick copper sheath that is inseparably molten-welded to a high-strength alloy steel core. And because it's molten-welded, the copper will not crack, flake or peel. As a result you eliminate maintenance costs.

Moreover, Type M Strand goes up fast because it is easy to handle. It can be readily dead-ended by any of the conventional methods. Our Engineering Data Bulletin E.D. 1878 gives you the complete story. Send for it today.

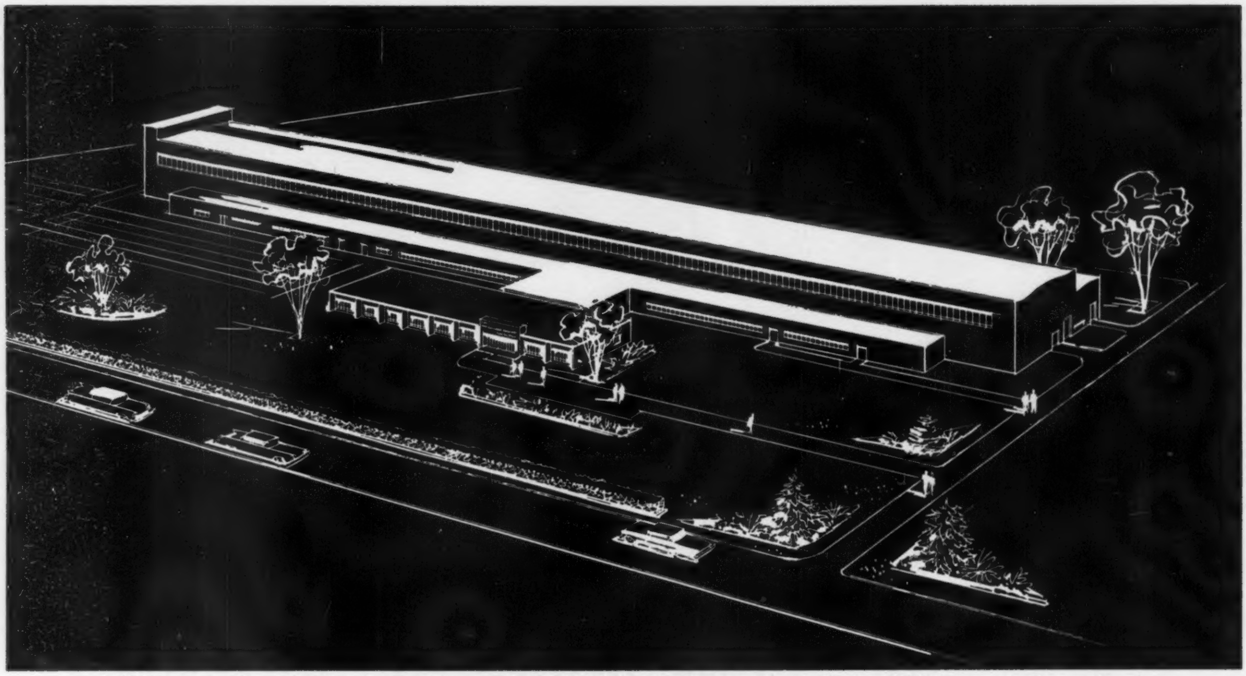
COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

COPPER
STEEL
MOLTEN-WELD

This microphotograph of the Molten-Weld shows how the grains of copper and steel interlock to form a permanent, continuous weld.



To Serve Electric



Artist's conception of Kellogg's new Power Piping Division headquarters and plant at Williamsport, Pennsylvania. The entire site covers about 50 acres.

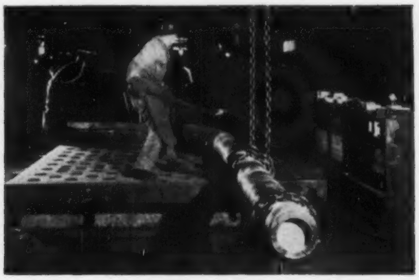
M
KELLOGG
W

As operating temperatures and pressures increase in central power generating stations, the need for stronger and superior materials, and for better methods of manufacturing power piping systems, becomes more acute.

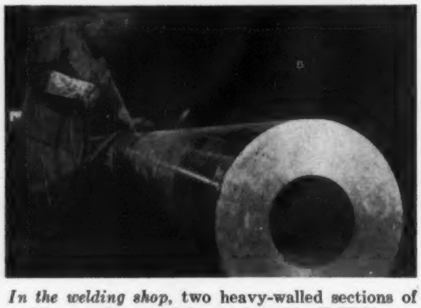
To help solve these problems, The M. W. Kellogg Company's Power Piping Division is building new metallurgical and welding laboratories as part of its complete manufacturing facilities at Williamsport.

The laboratory facilities and personnel, in addition to performing applied research and development for manufacturing power piping, will be available for consultation with clients on their problems and will act as a customer service laboratory.

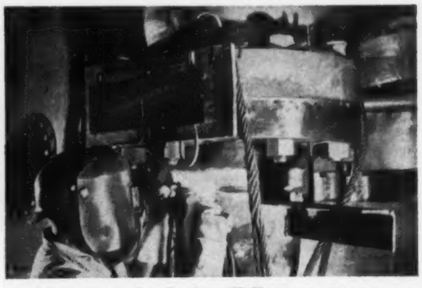
In the laboratory, a Kellogg metallurgist places sample of austenitic steel in heat-treating furnace. After heat treatment, the steel sample will be cut into sections and tested.



In the pipe bending shop, a length of stainless steel piping is bent to close tolerances. Dam in pipe retains inert gas introduced during heat treating to prevent oxidation.



In the welding shop, two heavy-walled sections of stainless steel power piping are joined by K-Weld—an inert gas-shielded technique of arc welding, patented by Kellogg, which assures long life.



In the customer's plant, a Kellogg operator uses K-Weld to install heavy sections of power piping which carry superheated steam from boilers to generators.

Utilities Still Better

Power Piping Division of M. W. Kellogg is Building New Headquarters and Manufacturing Plant in Pennsylvania

To still further improve the service it has given to electric utilities for over 40 years, the Power Piping Division of The M. W. Kellogg Company is now building new headquarters and a plant at Williamsport, Pennsylvania.

Planned for completion by Labor Day, the plant will specialize in the manufacture of high pressure, high temperature alloy and carbon steel piping for electric generating stations. Centrally located in Pennsylvania, Kellogg's Williamsport plant will be within easy distance from many Eastern industrial centers. From here, it is well situated to serve clients by road, rail, or air.

Representing an investment of approximately $4 million, these new facilities will have no equal in the power piping industry. Incorporating the most modern and time-saving equipment, the facilities have been designed throughout for maximum efficiency and economy.

With completion of its new plant, Kellogg will be better equipped than ever to tackle all orders for power piping promptly, and to carry them through to actual installations in customers' central stations from coast to coast.

At its new plant, Kellogg will have the engineering skills to manufacture complex piping systems; the men and equipment to cut, machine, bend, weld and heat treat piping of varying sizes and wall thicknesses.

Here, Kellogg will have the equipment to make electronic, radiographic, ultrasonic and other advanced tests to inspect the quality of the finished product. Here, it will have the metallurgical and welding laboratories to evaluate new and superior piping materials; to maintain a continuing program of development in welding and other manufacturing techniques, and add still further to its line of industry "firsts" listed at the right.

Kellogg's Power Piping Division welcomes inquiries on its new facilities from engineers of power generating companies, consulting engineers, and manufacturers of turbines, boilers, and allied equipment.

OTHER KELLOGG FIRSTS IN POWER PIPING

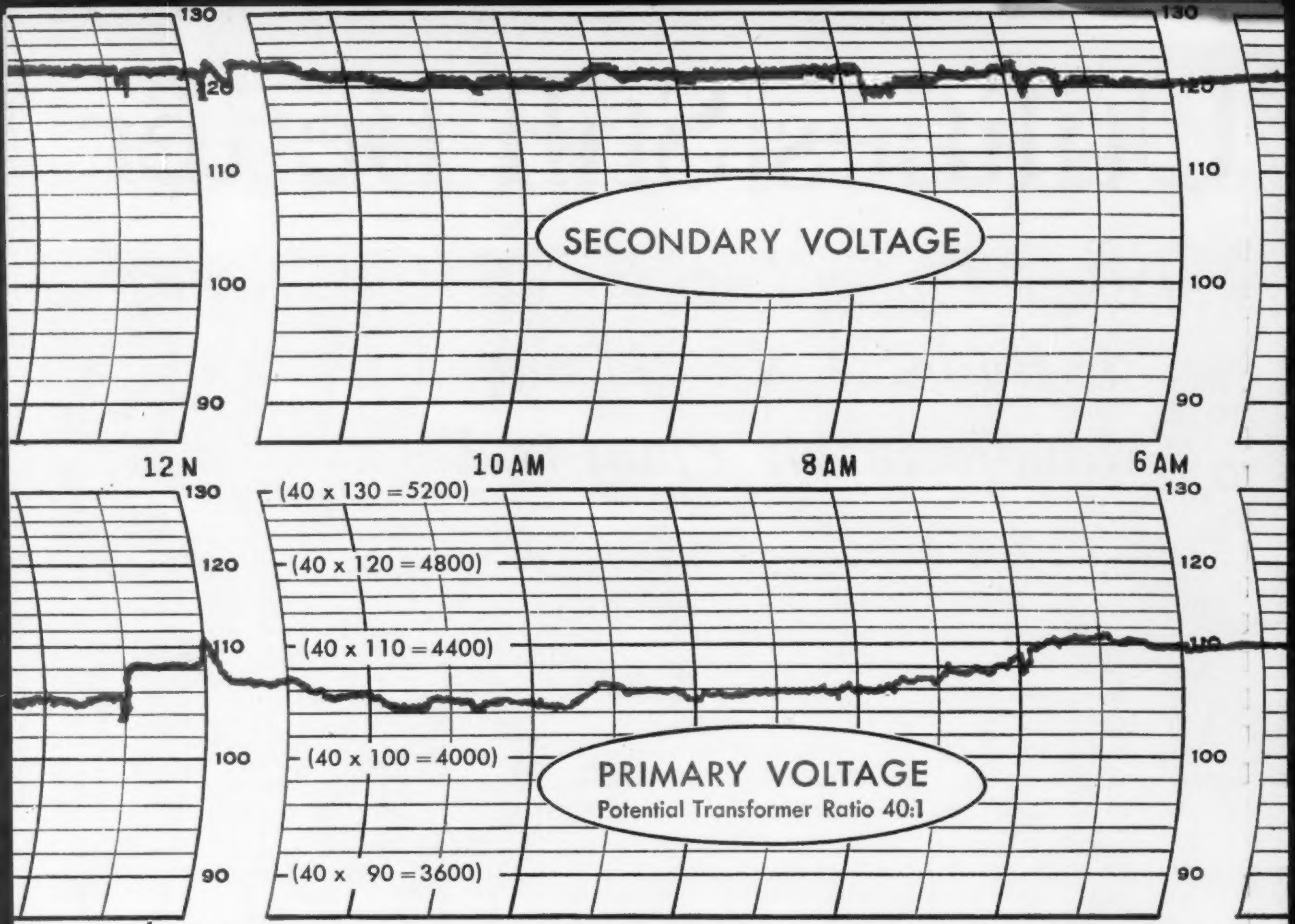
In 1931, Kellogg manufactured the first all-welded piping for the first high-temperature, high-pressure central station in the United States. Kellogg manufactured the first austenitic steel piping for a central station installation and has been continually experimenting since to establish the best materials, manufacturing techniques and heating cycles for welding and post-welding treatment, and to set specifications for electrodes.

FIRST IN MANUFACTURING OF:

Piping from C ½% Mo
Station piping for 900 F.
Station piping for 950 F.
Station piping for 2200 psi
C ½% Mo piping with #3-#5 actual grain size
1¼% Cr-½% Mo steam piping
Steam piping for 1000 F.
½% Cr-½% Mo station piping
2% Cr-½% Mo station piping
Station piping for 1000 F.
2¼% Cr-1% Mo station piping
1¼% Cr-½% Mo station piping
1% Cr-1% Mo V turbine piping
2¼% Cr-1% Mo V station piping
Station piping for 1050 F.
3% Cr-1% Mo station piping
Type 347 stainless turbine piping
Mercury vapor piping for 1000 F.
Station piping for 1003 F. for France
Type 347 stainless station piping
Station piping for 1100 F.
Type 316 stainless station piping
Type 316 stainless station piping for 3500 psi-1050 F., 325 MW
Type 316 stainless station piping for 5600 psi-1200 F., 325 MW

M KELLOGG W

POWER PIPING DIVISION · THE M. W. KELLOGG COMPANY
711 THIRD AVENUE, NEW YORK 17, N. Y. • A SUBSIDIARY OF PULLMAN INCORPORATED
Offices of Kellogg subsidiary companies are in Toronto, London, Paris, Rio de Janeiro, Caracas, Buenos Aires.



THESE VOLTAGE METER CHARTS were recorded between 6 A.M. and 12 noon on an average work day. Although the primary voltage varied between 4160 volts and 4500 volts, the output voltage of the SRT remained between 120 and 124 volts.

L-M SRT® Provides Simple Solution For Regulation at Industrial Plant

Recognizing SRT as an engineering development and realizing its possibilities for future customer requirements, Cleveland Electric Illuminating Company installed a Line Material SRT (Self-Regulating Transformer) at the end of a primary feeder.

A 37½ kva load was supplied to an industrial plant by one of Cleveland Electric Illuminating Company's 4340 volt primary feeders. This plant was located on the last third of the feeder and was subjected to variations in primary voltage. As in all industrial loads, the demand factor further complicated the situation. This 3-wire, single-phase, 120/240 volt load had primary voltage variation between 4160 volts and 4500 volts during the working day.

Cleveland Electric Illuminating Company decided to try a test installation of a Line Material SRT. The Adapt-a-Tap range was selected to permit fully automatic control within a primary voltage band in excess of 8 percent. The midpoint was set at 121 volts with a band width of four volts.

After the SRT was installed, the metered secondary voltage of this industrial load remained within the band from a fraction of a volt less than 120 volts to a fraction of a volt more than 124 volts, while metered primary voltages varied between 4160 volts and 4500 volts.

Get Data on the SRT

Line Material's SRT can solve an unlimited number of regulation problems where the solution is most imperative *at the load.* For information on how the SRT can solve your regulation problems, contact your L-M Field Engineer; or write Line Material Industries, Milwaukee 1, Wisconsin.

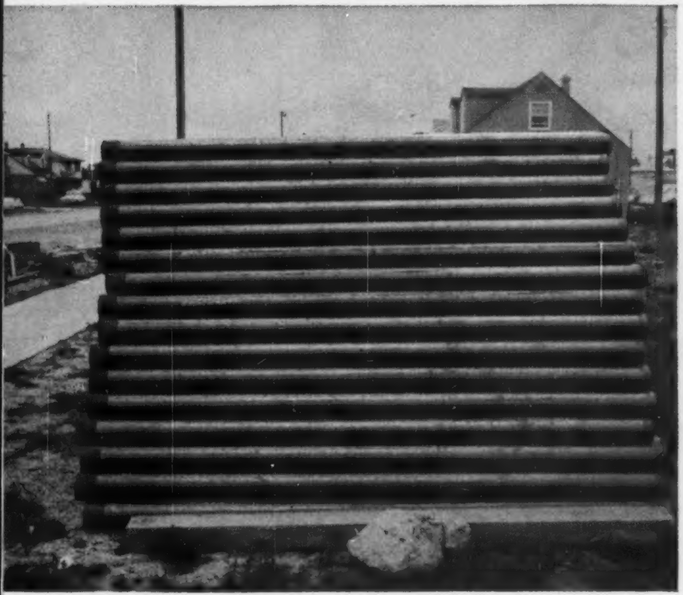
THIS 37½ KVA SRT was installed in a vault adjacent to the industrial plant. Secondary runs were short and voltage regulation with the SRT was improved.

LINE MATERIAL Industries
McGRAW-EDISON COMPANY
Distribution Transformers

McGRAW EDISON

This is L-M's Transformer Silver Anniversary

Flush-Fit Couplings on L-M Permaline Conduit Provide Big 3-Way Savings



SAVINGS IN STORAGE are realized since the coupling is attached to the conduit. Coupling cartons are eliminated.

Big savings are possible with L-M Permaline Conduit and the Flush-Fit Coupling. The couplings are installed at the factory on one end of each 2, 3, 3½, 4, 4½ and 5-inch sizes of Permaline Conduit. Thus, you save in three important ways since the coupling and conduit are bought, stored and installed as one complete unit:

Savings in Storage . . . coupling cartons are eliminated.

Savings in Handling . . . coupling and conduit are one unit.

Savings in Installation . . . coupling is already attached; no couplings to attach on the job site.

L-M Flush-Fit Couplings have the same outside diameter as the conduit. Joints do not have to be staggered. You install Permaline conduit as fast as you can get it into the trench.

Other Permaline Advantages

Permaline Conduit offers many other time and money-saving advantages:

Smoother Inner Bore . . . Faster, trouble-free cable pulling.

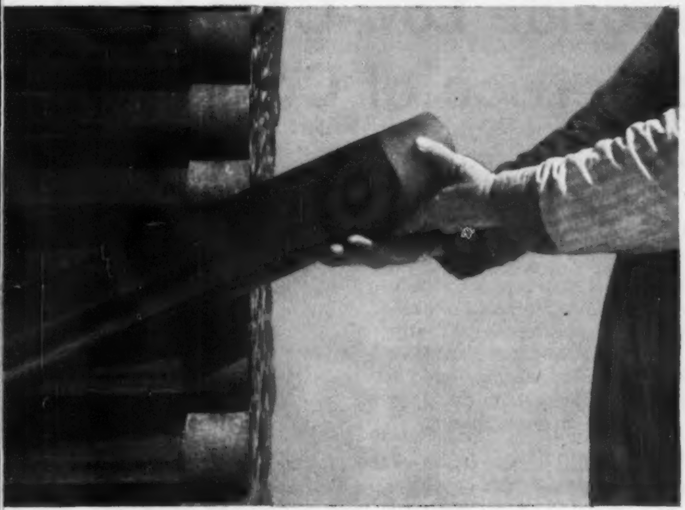
Choice of Shipping Methods . . . Bulk, fork-lift bundles or steel-strapped slings for fast, easy handling.

Complete Line . . . All sizes; 5, 8 or 10-foot lengths; all accessories.

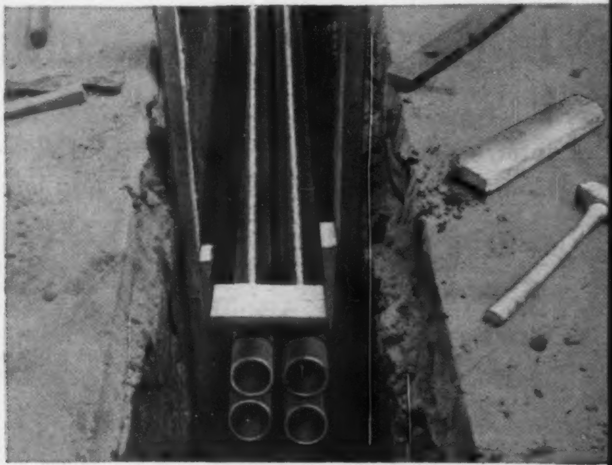
Complete Stocks At Strategic Warehouses . . . One is conveniently located near you.

Exceptional Service . . . More than 100 Permaline representatives in the U. S. ready to serve you.

Engineering Service . . . Complete technical assistance on your proposed system.



SAVINGS IN HANDLING are possible because the coupling is attached to the conduit at the factory. No cartons to check in and out of your warehouse.



SAVINGS IN INSTALLATION are possible because coupling and pipe are taper-fitted, and need only be driven with wood block and hammer to provide tightest possible joint.

Get Complete Information . . . For complete information on Permaline Conduit with Flush-Fit Couplings or any Permaline product, contact your L-M Field Engineer or Permaline Specialist; or, write Line Material Industries, Milwaukee 1, Wisconsin; ask for a copy of L-M's Underground Construction Handbook, 12-point Plan Folder and Permaline Conduit Bulletin UG1A. In Canada: Canadian Line Materials, Division of McGraw-Edison Company (Canada), Limited, Toronto 13, Ont.

LINE MATERIAL Industries

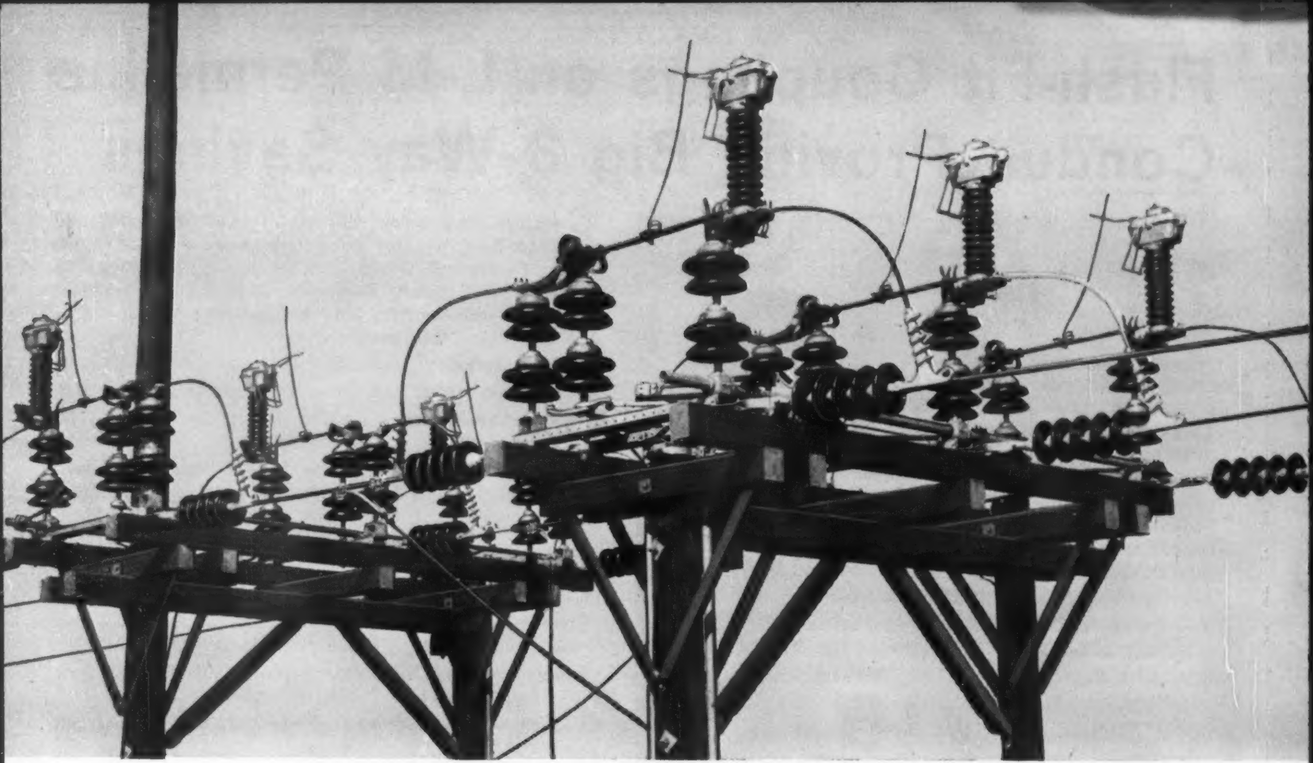
McGRAW-EDISON COMPANY

McGRAW EDISON

427

Permaline Fibre Conduit

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT



THESE L-M 69 kv OIL INTERRUPTERS, mounted on L-M PV switches, provide low-cost interruption for the Grand Valley Rural Power Line substation tap of Public Service Company of Colorado.

L-M Oil Interrupters Provide Low-Cost Load Interruption for Public Service of Colorado

L-M Type PV air-break switches and high-voltage oil interrupters were installed for Grand Valley tap of Public Service Company of Colorado at transmission line tie

The Grand Junction and the Cameo steam generating plants of Public Service Company of Colorado are tied together by a 69 kv transmission loop 45 miles long. At the Grand Valley Rural Power Lines substation tap, 15 miles from the Cameo plant, the two lines are tied together by means of two gang-operated L-M Type PV air-break switches equipped with oil interrupters on both sides of the substation tap. With L-M oil interrupters, the switches sectionalize the line on either side without disturbing power flow to this substation.

Increased Flexibility at Minimum Cost

L-M OIL INTERRUPTERS provide a load-interrupting means at the lowest possible cost. By installing L-M Type PV air-break switches and oil interrupters, Public Service Company of Colorado typfies utilities who are cutting costs without sacrificing quality and dependability on switching problems.

L-M's oil interrupters have been specifically designed to provide a low-cost means of picking up or interrupting load currents, line charging currents and magnetizing currents. They can be mounted on new or existing Type PV vertical air-break switches, with no change in the electrical clearances or phase spacing.

Complete Range of Ratings

L-M oil interrupters are available in voltage ratings of 23, 34.5, 56 and 69 kv. All have continuous current ratings of 600 amperes at power factors as low as 70%, with momentary rating of 40,000 amps for 10 cycles and 25,000 amps for 4 seconds.

Get Complete Information

Ask your L-M Field Engineer for complete information on L-M oil interrupters. He has a cutaway sample to show you. Or write direct to Line Material Industries, Milwaukee 1, Wis.

Be sure you see this cutaway sample! With it, your L-M Field Engineer can demonstrate the construction and operation of this excellent, economical Line Material load break device.

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LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

McGRAW EDISON

Editorial Comment

APRIL 25, 1960

The Antitrust Cases: 1–

In Perspective

Federal antitrust suits touch most industries at one time or another. Lately, it has been the electrical equipment manufacturers' turn.

It is essential the matter be put in perspective.

From guilty pleas already entered, we must assume the antitrust laws have been broken, at least in some instances. And if the law has been violated as alleged, we cannot quarrel with the intent of the government suits, though their original motivation may have had political undertones. The industry should welcome the opportunity to clean up any abuses which may exist.

To us, the various alleged offenses present sharply different ethical aspects. Two of the major infractions, business allocation, and bid (or quotation) rigging, we believe completely improper and incapable of justification. The other, price fixing, for us falls at least in a zone of questionable practice.

Complete understanding of the beginnings of some of these pricing practices involves backgrounds of patent cross-licensing, "reasonable" profit levels in many equipment lines, and an equipment industry which has teamed with its utility customers over the years to serve the ultimate consumer and the nation well.

The utilities understand the issue completely. We've gotten few reactions of moral outrage or even strong resentment in our many contacts with executives. Generally, they feel they've been well treated. Perhaps they're not positive the price levels they've paid for some products couldn't have been somewhat lower under a "freer" market. But we do know they're positive they haven't been greatly affected.

On the other hand, we've found no deep compassion for the defendant companies, that emotion being reserved for some individuals regarded as scapegoats. Understanding, then, if not compassion, is the rule.

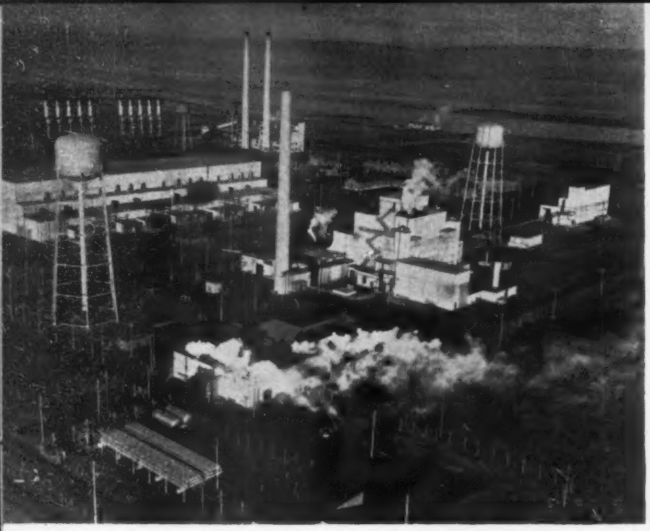
So much for moral reactions. Any bitterness which may have been generated will heal quickly, for the manufacturers have a vast reservoir of good will built over the years.

We believe the basic purpose of the Sherman Antitrust Act is sound, though its administration has not always been uniform or equitable. Key to the achievement of the law's intent lies in judicious administration, as is true for any statute.

What will be the overall result of the court decisions? While being meticulous to avoid pre-judging yet unproved indictments, we must assume there will be some judgments. Will they usher in a period of fair and reasonable prices set in a "free" marketplace? Or will they bring uncertainty, with unstable prices, restricted interchange of technical information, and possibly the loss of some valued members of the business community?

We believe the future hinges on the court rulings and the industry's interpretation of the rulings; and on the future attitude toward all aspects of competition by buyer as well as seller.

These considerations far override any presently-held reactions to the litigation. They are of such vital importance we will devote further editorial comment in the next two issues to them.



Drive for Hanford

- **Move by Congressional Democrats on Joint Committee to add 636 Mw to plutonium producer at Hanford grinds to a halt**
- **Huge AEC construction budget, a possible veto, and majority discord seen as reasons**
- **But issue will probably be back next year**

Whatever other developments take place this year at the Atomic Energy Commission's plutonium production facility at Hanford, Wash., (see photograph above), the addition of about 700 Mw of power generation equipment will not be one of them.

The drive by Congressional Democrats to pass legislation for the $130 million worth of equipment ground to a halt last week. But the measure authorizing switchover of the new plutonium production reactor (NPR)—or one like it—will be up again next year, when there will be less chance of a Presidential veto, regardless of who occupies the White House.

The political strategists of the Joint Committee on Atómic Energy, meanwhile, have secured the AEC's agreement to begin design and engineering studies. The money for these studies will come from the AEC's fiscal '61 operating funds.

Why did JCAE decide against writing into the commission's authorization bill funds for the 636-Mw-plant? One of its leading members points to these considerations:

- First, a last-minute $107-million Administration request for the Stanford accelerator swelled AEC's new construction requests to $204 mil-

California PUC Says Utilities May Use

Three-point decision also makes liberalized depreciation optional while making accelerated amortization selective

The California Public Utilities Commission has issued its decision in the investigation concerning the proper treatment for rate making purposes to be accorded accelerated amortization and liberalized depreciation. In an eight-page decision and order the Commission said:

(1) That for purposes of rate fixing utilities may charge to operating expense only the amount of taxes actually paid;

(2) That it would leave to management of utilities the election whether or not to take liberalized depreciation on property acquired after Dec. 31, 1953;

(3) That it would consider accelerated amortization on certified property in individual proceedings, since amortization is different from liberalized depreciation in that it provides a definite end to accelerated amortization in five years.

The order was signed by Commission President Everett C. McKeage, and Commissioners Peter E. Mitchell and Theodore H. Jenner. Commissioners C. Lynn Fox and Matthew J. Dooley filed dissenting opinions on the case.

Reject Utilities Claim

The Commission rejected the claim of some utilities that liberalized depreciation results in a tax deferral, and said "there is created no income tax deferral and no deferred tax liability. The operation of said section (Section 167 of the Internal Revenue Code) provides a vehicle and a procedure whereby the taxpayer may reduce his taxes just as though the tax rate had been reduced."

In his dissent Commissioner Fox said that he believes from all the evidence in the proceeding that "the majority opinion is adverse to the public interest." He said Congress intended Section 167 to enable companies to generate internally additional funds to help pay for new plants to meet rapidly expanding needs.

Fox said that by use of funds thus acquired the cost of money to utilities would be reduced since they would have to borrow less. Since cost of money is a factor in determining rates, the less the cost of money the lower rates can be. He added that utilities advocated a further sharing of benefits with ratepayers by paying interest on the fund created by normalization.

Today's decision denied the plea of many utilities to be permitted to "normalize" tax payments, that is, to pay the lower tax resulting from taking liberalized depreciation but, for rate making calculations to charge as an expense the taxes that

Power Generation Facilities Bogs Down

lion. Had the Hanford conversion item been added, the total would have exceeded $400 million, a figure Congress probably would have turned down. Consequently, neither item shows up in the bill, which now asks a total of $211 million. Some minority members claim Stanford was deliberately held back by Democrats to be used as lever next year. In other words, no NPR power, no Stanford accelerator.

- Second, had NPR steam and power equipment been voted, Eisenhower would surely have vetoed it.
- Third, more time was needed to analyze a special economic feasibility study ordered by the Joint Committee. This study is being performed by R. W. Beck Co of Seattle.

Another development—possible discord among the Democratic majority—may have played a role also in the failure of the Joint Committee to vote the power conversion equipment.

Two influential committee members, Sen Henry Jackson (D-Wash.) and Rep Chet Holifield (D-Calif.), recommended that power generating facilities be built this year. Said Holifield: "I will recommend its acceptance as a budget item to the (AEC) fiscal year 1961 budget." And Jackson, supporting the Californian, added "I am convinced that it is feasible."

But the Joint Committee's chairman, Sen Clinton Anderson (D-N.M.), said, "I doubt if the NPR will come up this year."

Holifield Sees It Next Year

However, Holifield, like the proverbial Dodger fan, says things will be different next year . . . when he will become chairman, if the Democrats keep control of Congress. He has promised an all-out effort to legislate Hanford power facilities into being at that time. And, perhaps as a hint of things to come, AEC's reactor divisions are starting an "intensive review" of past studies of the dual-purpose NPR plutonium and power plan.

What will these studies of studies reveal?

Francis Adams, head of the Federal Power Commission's Bureau of Power, believes that the technical studies have gone as far as they can, and that now the public policy question must be decided by those who are politically accountable. "Our report is neither fish nor fowl, but there is sufficient information in it to make a judgment—based on the public interest—to place a federally owned steam facility into operation at the NPR site," Adams said.

He feels, too, the matter of NPR power can be set up for the time being without preference clause recommendations. He believes NPR power could be dispensed on the basis of actual power needs.

Only Actual Taxes in Rate-Making

would have been paid if straight line depreciation were used. The theory advanced by advocates of such treatment in rate making was that higher taxes would have to be paid in the future and that the difference between actual taxes paid under liberalized depreciation and straight line depreciation was a "deferred" tax payment. The money so saved or deferred would be credited to a reserve fund.

The Commission declared that rate fixing "is a practical and pragmatic procedure" and that "we cannot close our eyes to the future and what reasonably the future will produce." It said, "the record is clear that public utilities, for the foreseeable future, will continue to construct new plant to an extent which will be sufficient to more than overcome retirements to such plant. In such circumstances, the theory of normalization, based upon the concept of a deferred tax liability, would not have an opportunity to operate. Here, regulatory authority must be concerned with what reasonably will happen and not with that which theoretically might happen."

The Commission pointed out that court decisions have rejected the theory of normalization and said it must be remembered that a public utility is not in the same category, factually or legally, as an unregulated company. It added, that "in essence, a public utility is charged with the administering of a public trust delegated to it by the state."

Dissent Looks at Outlays

In dissenting from the Apr. 12 order of the California Public Utilities Commission concerning accelerated depreciation, Commissioner Dooley urged the PUC to consider the huge sums of money utilities will have to raise for expansion which will be required as a result of the explosive growth of the state.

"The basic purpose of rate-making is to design reasonable rates which will produce revenues sufficient to cover future costs of operation as to render adequate service to the consumer, plus a reasonable return to the utility. Such return should be adequate to compensate present investors in the business for the use of capital and to attract new capital from investors on favorable terms, as the occasion arises. This concept of rate-making is the fundamental ground for my dissent."

Dooley said approval of modified normalization of income taxes for accounting purposes and rate-fixing would not raise existing rates, make more money available for dividends on outstanding stock, or increase capital or earned surplus. Revenues from customers would not be more than when depreciation for tax purposes is computed on a straight-line basis. If difficulties were to arise later over accumulated tax reserves, the PUC could deal with such cases individually, he declared.

Different Views on Upper Colorado

Utilities, preference customers give varying views before Senate group on proposed Colorado Storage Project power

Private utilities and preference customers disagree on whether preference customers would use the full power output of the proposed Colorado River Storage Project.

E. M. Naughton, president and general manager of Utah Power & Light Co, told a Senate Appropriations Subcommittee that "the indicated requirements of preference customers . . . are for many years substantially less than the project's potential power generation." He said realization of maximum power revenues would therefore require that private utilities absorb substantial project power through 1980.

He urged that no money be spent to construct transmission facilities that would duplicate existing facilities or "facilities that the private companies are going to construct." He outlined plans of private companies to construct facilities to serve 20 million kw of load in the five-state area for the next 20 years, including the 1.2 million kw to be supplied by the project. The program encompasses construction of 2,000 miles of high voltage transmission lines and other facilities costing $90 million, cutting the government's cost from $157 million to $42 million.

D. W. Reeves, president of the Public Service Co of New Mexico, said the act establishing the project makes it clear that electric power is incidental to reclamation purposes. Therefore, he said, power should be sold at rates that would avoid subsidy to any electric system and private transmission facilities should be used to keep the government's investment as low as possible.

Preference customers' viewpoint was presented by Marion M. Wilson, president of Colorado River Basin Consumers Power Inc which represents 1.3 million preference consumers in the five-state area. Studies by his organization show that preference power users "can at all times use all project power."

Wilson expressed concern that construction of power transmission facilities, which will accommodate power sales to repay 91% of the project cost, is a year behind construction of generating facilities. He said a federal power transmission system is fundamental "to assure project repayment, maximum assistance to participating projects, and the delivery of power to major load centers of preference customers" at reasonable rates.

The president of Intermountain Consumer Power Assn, W. Berry Hutchings, said it was "conclusive" that there will be no power available to private utilities and that he was "amazed" they should offer to make big investments in lines for wheeling purposes only. He felt the companies could not do that without operating at a loss "if their cost for wheeling is maintained the same as is proposed in the federally owned system."

The Wyoming State REA's representative backed the plea for federally-owned lines. Harold Cash said this would assure the fullest coordination of a complex power system and would also permit the Bureau of Reclamation "to take full advantage of the diversity of loads between the north and south basin states where peak loads occur at different seasons of the year."

Contractor Must Pay Subsistence Allowance

Merritt-Chapman-Scott, the contractor building the $108-million Glen Canyon dam on the Upper Colorado, lost its long fight to have the government pick up 85% of the higher labor costs it is paying.

The added cost to the company could run from $3- to $5-million.

The basis for the furor is the fact that under its contract with the government, subsistence payments can't be escalated, but outright wage increases can be.

In the spring of 1958, the Arizona Contractors Assn negotiated a three-year contract with the electrical workers which called for a base rate in so-called "free cities" of $3.80, and higher "zone rates" up to $4.90 per hour depending on the construction site's distance from specified "free cities." Prior to this agreement, the allowance for travel expense was $7.00 a day. Merritt-Chapman adopted the same agreement, although it is not a member of the Arizona association.

Disagree on Wage Hike

In the spring of 1959, Merritt-Chapman asked the Bureau of Reclamation to apply escalation to the added wages, which, at Page, Ariz., the Glen Canyon city, amounted to the maximum $1.10 over base scale. The Bureau ruled against paying any part of this increase, saying that the higher hourly rate amounted to subsistence allowance.

By mid-1959, the construction trades had negotiated with the Arizona contractors an agreement calling for subsistence allowances up to $6 a day. After a month-long strike ending last December Merritt-Chapman signed an agreement with the construction trades calling for hourly wage rates higher than the basic scale, but with no reference to travel allowance or subsistence.

Interior officials gave Merritt-Chapman the same ruling on the construction trades as it had earlier on the electricians: no escalation for wage increases that the Bureau considers subsistence or travel.

The dispute was turned over Comptroller-General Joseph Campbell, who ruled against the company.

Said Campbell: the payment by the contractor was designed to create an obligation on the part of the government to absorb 85% of a subsistence allowance "under the guise of an increase in wage rates."

A house is not a home without . . .

a 75-kva substation to . . .

Help Shave the Cost of Residential Service

All of the economies of unit substation operation are available to the owner of today's all-electric home, according to J. B. Cottell, president of Continental Electric Equipment Co. Not only are energy costs materially lowered through lower rates, says Cottell, but important savings can be obtained through more efficient operation of the heating, lighting and motor loads in the house.

Cottell set out to prove his point by having a 75-kva substation installed in his large (see above) suburban Cincinnati home. He was in the enviable position of having his firm design and build the unit.

Power is purchased at 2,300 v (at a "wholesale" rate) and is stepped down in the transformer section of the substation to 120/240-v for services. Cottell maintains that, while buying 2,300-v service, it is relatively inexpensive to install underground service.

The unit is air-cooled and fire hazard is virtually eliminated says Cottell. It is of "dead-front" construction, and is amply protected against lightning and fault currents. The low-voltage section incorporates switch and fuse sections units for distribution to circuit-breaker-type load centers. These centers are centrally located to cut costly wiring. Present load is 40 kva.

Cottell feels that he will gain some added benefits through lower insurance charges on the flameless house.

Illinois Supreme Court Reverses Itself on Depreciation

After once ruling that only actual taxes paid could be used by utilities for the purpose of rate making, and that normalization of taxes as prescribed by the Illinois Commerce Commission was in error, the Illinois Supreme Court has reversed its position.

Originally the court held that growth in utilities produces a permanent deferral, and this is now subordinated to the argument that future expansion is not necessarily certain so accelerated depreciation might not be allowed in the future.

The first opinion that there was a permanent forgiveness of taxes is now qualified with the statement: "However, several not unlikely events might occur which would prove the assumption erroneous. A war, general depression or a decline in the local market might curtail a utility's capital expenditures, and prevent further tax deferrals. As a result, taxes might increase just at a time when economic circumstances would make the added expense most burdensome. It is also possible that Section 167 (Internal Revenue Code) will be repealed, thus ending further tax deferrals."

The decision states: "At this time, we think it permissible for the Commission to safeguard the financial integrity of utilities by recognizing as present expenses those tax liabilities which are deferred by use of accelerated depreciation for Federal tax purposes."

However, the court makes it clear that reserves coming from deferral must be deducted from the rate base so the benefit is not passed along to stockholders.

The court left the door open for present or future commissions to prescribe actual taxes by saying: "The assumption of a continuous deferral of taxes due to accelerated depreciation may be justified in many cases and the Commission would be justified in acting on this assumption if it saw fit."

Utilities Oppose Iowa USBR Transmission

Technical as well as economic feasibility of proposed federal transmission lines in Iowa have been challenged by the state's six major electric utility companies.

Edward Ruisch, vice president of Iowa Public Service company, acting as spokesman for the utilities before the Public Works Subcommittee of the Senate Appropriations Committee, said the utility-owned grid already in existence is adequate to wheel Missouri Basin power to REA's and other preference customers without the federal lines.

Preference customers are attempting to have the government build lines from Sioux City to Spencer and from Sioux City to Creston.

A Bureau of Reclamation study of the project shows that it would operate at a deficit of $49,300 the first year, and by the fifth year there would be a surplus of $12,600 a year which continues on to the end of the 50-year study.

Pointing out that this is a narrow margin, Ruisch said the estimates do not include cost of tie-in with utility systems, and that the single lines would not be reliable enough by themselves. He cited a history of five transmission or generation failures occurring in the utilities' systems that were minimized by interconnection.

Ironically, the transmission lines are receiving some troublesome protests from REA customers, farmers, who do not want the right-of-way to cut across their fields. If alternate routes along section lines had to be used the cost of the lines would be even greater. The plan calls for a 161-kv, "H" frame line.

The companies involved in the joint action against the USBR lines are Iowa Electric Light & Power Co, Iowa Power & Light Co, Iowa-Illinois Gas & Electric Co, Iowa Southern Utilities Co, Interstate Power Co and Iowa Public Service Co.

Preference Groups Want Lines

John J. Hyde, manager of Southwestern Federated Power Cooperative and chairman of the Iowa Committee on Missouri River Power, argued against any delay in the appropriation for the USBR transmission line.

"We sincerely believe that any request by any parties to delay appropriations until a network analyzer study is completed would lack honesty, because the network analyzer study now being conducted in Denver has nothing to do with the fairness of the preference customers in Iowa to have low cost hydro power delivered by Bureau facilities," he said.

He added that it also has nothing to do with economic feasibility. The feasibility study was made last year by the Interior Department before the initial appropriations were requested, he said.

Hyde testified that the cooperatives had received "excellent cooperation" from the Bureau of Reclamation since work began on the line. The Bureau accepted co-op's offer of substation sites at Creston and Spencer adjacent to cooperatives' steam plants, he reported, and improved the construction schedule of the Denison-Creston line and substation over the one first set up by them a year ago.

On April 11, the REA approved a loan of $2,020,000 for 65 miles of 69-kv transmission line and substations.

Power will be available in 1962.

Direct Purchase of Gas Draws Some Opposition

As the U. S. Supreme Court agreed to review a decision by the United States Court of Appeals for the Third District to allow Consolidated Edison Co to buy natural gas direct from Texas producers, several intervenors filed briefs favoring the review.

Filing briefs in favor of the review were California and its Public Utilities Commission, Southern California Gas Co, Southern Counties (Calif.) Gas Co and Jerome J. McGrath for the National Coal Assn.

Interest in the issue comes from the fact that the Federal Power Commission has no direct control over the price charged for the gas unless it is sold to a pipeline company for resale to the user. Intervenors contend that direct sale will tend to inflate the price.

Consolidated Edison had agreed to pay 19¼¢ per 1,000 cu ft for the gas, which is to be used in the company's 765-Mw generating station beside New York's East River. FPC approval was needed for transport of the gas. The approval was sought by Transcontinental Gas Pipe Line Corp. FPC denied the approval, and this opinion was reversed by the Court of Appeals on the basis that the FPC had no power to weigh the end use of the gas or the effect of the sale on price levels.

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First Power From Dresden Flows to Illinois Homes

First output from Dresden Nuclear Power Station of Commonwealth Edison Co reached 64,000 kw, according to a report from the company and General Electric Co.

It is now flowing to customers of Commonwealth Edison.

Output will be stepped up gradually during the next several weeks, with testing done at various levels. It will be brought up to half-power, and then shut down for performance checks. It is expected to be up to full 180,000-kw production this summer, slightly over three years after the start of construction.

Dresden is the largest nuclear power reactor in service or under construction in the U.S., and is also the first full-scale privately financed nuclear power plant in the world.

An AEC permit allows bringing the plant to one-half capability initially.

Rally to the Profit System, APC Told

Taxation, congressional investigations, regulation beget new immorality, Chicago meeting is warned by J. R. Conrad

Americans must return to the basic truth that profit is moral and creative, the American Power Conference was told recently at its opening session in Chicago.

Unless there is a reawakening to these basic facts, Americans will succumb to that immorality that is a byproduct of current attacks on profit, declared John R. Conrad, president of S&C Electric Co. He urged a resurgence of loyalty to the "people's capitalism" of our times.

"The immorality fostered by the attacks on profit," he said, "is worse than any of the sins imputed to 19th-century capitalism. Taxation, congressional investigations, and rate regulation breed in our business community the evasion of taxes by way of expense-account living and loop-hole accounting, and the diversion of industry's best brains from the creation of real wealth to preoccupation with financial and legal manipulations.

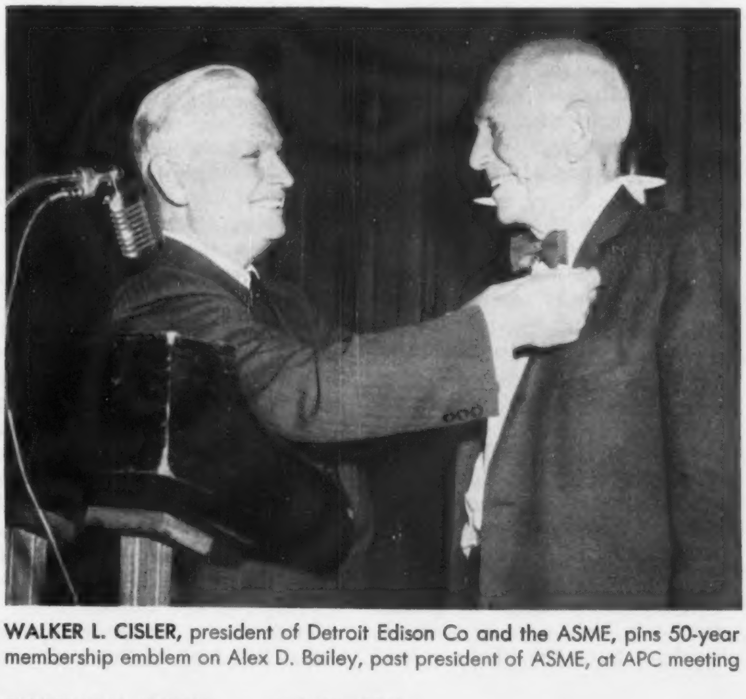
"Those attacked," Conrad continued, "include profitable industries that have used profit to finance breakthroughs in medicine and automation, and we are seeing basic industries choked off through regulation. Price-fixing and other conspiracies flourish to prolong the life of unprofitable products and companies." (See also page 173.)

Sees System Spreading

American economic power, based on the profit system, is characterized by a high level of output and growth and spreading of its benefits among all elements of the population, declared W. Allen Wallis, special assistant to the President of the United States.

This system is spreading throughout the world today, he said, noting that even USSR has adopted it, in part, by relying heavily on incentives. Yet there is a danger, he warned, for many people underestimate the time it takes to build such an economy.

JOHN R. CONRAD



WALKER L. CISLER, president of Detroit Edison Co and the ASME, pins 50-year membership emblem on Alex D. Bailey, past president of ASME, at APC meeting

Walker L. Cisler, president of Detroit Edison Co, told a luncheon conference that the Russian electric power industry is today in a general state of development equivalent to ours of 25 years ago. Soviet nuclear power, he said, is not outstripping that of the U.S.

Cisler noted that the Russians "have extensive fossil fuel reserves which they use abundantly in their thermal stations, realizing, as we do, that economic nuclear power is yet to be achieved."

Cisler, a member of touring delegations to Russia in 1958 and 1959, said that the Russian pattern of power system development has changed since the Stalin era. Since 1958, Khrushchev has de-emphasized hydro development in favor of thermal generation, seeking to obtain more capacity in less time at less cost.

The utility industry today needs young men who will make power their life work and move ahead with the industry in a period of promise, Allen S. King, president of Northern States Power Co, declared.

The utilities, King said, have failed to spell out the attractive possibilities for talent and ability in a industry in which developments have come thick and fast in recent years. He listed nearly 50 pioneering activities undertaken in the power field today, projects reflected in the subjects discussed at the conference itself.

(*More APC on next page*)

Generation for Low-Cost Peaking

Power generation sessions, considering diverse schemes for obtaining low-cost peak generation, heard proposals for using the steam cycle, as well as the usual internal combustion engines and gas turbine units.

L. B. LeVesconte and Tor Kolflat, Sargent & Lundy, described schemes by which a steam plant in the design stage could obtain 10 to 20% short-time peak capacity at well below average incremental capacity cost. The schemes involved:

1. Reducing the amount of steam extracted for feedwater heating by omitting one or several top heaters

2. Operating turbines at about 5% higher pressure to obtain a short-time increase in steam flow and turbine output

3. By-passing steam around the turbine high-pressure stages to admit more steam to low stages for securing up to 40% more turbine capacity

4. Shifting from coal to oil or gas during peak hours to obtain a 20% increase in boiler output.

Such measures, the authors said, provide incremental capacity at costs from $10 to $95 per kw. Specialized peaking capacity, such as pumped storage, gas turbines, and internal combustion engines, they said, yield peaking capacity at costs of $90 to $150 per kw. The magnitude, location, duration, and frequency of peak load, they added, should receive careful review in selection of the proper peaking method to use.

Heat Rate Depressed

The chief disadvantage of obtaining short-time peaking capacity by varying the steam cycle arrangement is the decrease in heat rate at normal turbine capability and at lower loads, declared F. A. Ritchings and R. R. Bennett, Ebasco Services.

Assuming a 1% loss in heat rate, a capitalized cost of $250,000 is chargeable to these systems, they observed. This loss in heat rate, they said, raises the incremental cost $2.50 to $4 per kw varying with the scheme selected, although the incremental cost of peaking capacity would still be low. It is therefore evident, they noted, that means must be found to reduce the capital expenditures for meeting peak demands that contribute little to energy sales.

J. E. Downs, General Electric Co, described two economic means of obtaining low-cost spinning reserve. In one, turbine generator units could be designed for maximum efficiency at a 100% base load capacity with features designed into them to permit increasing pressure for short peak-load periods and getting up to 40% more output from the unit. Such units would yield low-cost reserve capacity. Efficiencies would decrease moderately as the output above base load capacity increases.

But this decrease is not significant, as the hours of operation at the higher loads would be few. Pressure would be increased for 1,800-psi base load units to 2,400 psi, and for 2,400-psi base load units to 3,200 psi. Design of the turbine and other system parts would need modification.

The second way to increase spinning reserve, Downs said, would be the introduction of additional steam into the cycle at the reheat point, bypassing the high-pressure turbine with the high-pressure, high-temperature steam.

From a study of new generation concepts and their applications, A. G. Mellor and W. D. March, General Electric Co, presented these conclusions:

1. Addition of spinning reserve turbine capacity brings only a small production cost penalty and, moreover, the capacity operates only a few hours a year above its base capacity and rarely at its maximum capability.

2. The heat rate of peaking capacity has little effect on the fuel cost penalty incurred, but a large effect on hours of operation.

3. The saving in operating cost from unattended peaking generation is a major factor in peaking generation economics.

4. As the load factor at which a generating unit operates over its life depends on the efficiency level of units subsequently added to the system, rule-of-thumb evaluations tend to be unrealistic.

J. O. Stephens and B. L. Lloyd, Westinghouse Electric Corp, analyzing the factors in the choice between a gas turbine and steam units in the expansion of a station, showed that present worth of fuel and production requirements would be $2 million less for the gas turbine peaking plan than for the base plan over a 12-year period. Their analyses were based on a gas turbine plant capital cost of $95 per kw (winter rating). A summer rated plant, costing $110 per kw, on the other hand, showed a $1 million present-worth saving.

Break-even cost was $127 per kw. They also described the characteristics of a new 22-Mw peaking gas turbine unit for Philadelphia Electric Co which has a heat rate of 15,750 Btu per kwhr based on the lower heat value. Operating temperature has been increased from 1,350 to 1,450F for peak-load service. Two bearings support the rotating element, eliminating alignment and fire hazards. A curvic coupled disc rotor eliminates thermal stresses due to gradients from inlet to exhaust. Tangential struts support the turbine exhaust bearing and keep the turbine rotor on center with cylinder casing.

Large Units Give Best Economy

Turbine-generator units in 400, 600, and 800-Mw sizes are more economical than multiples of small units where system conditions accommodate the larger sizes, reported John R. Carlton, Westinghouse. Energy costs are cut by installing the larger units, whose reliability can be expected to be continuously excellent. Very large turbines, built from a multiplicity of pre-engineered parts of smaller machines, he said, result in lower turbine costs and more attractive prices to the user. Experience with turbines in the 400 to 800-Mw sizes, he said, pave the way for the next general advance in steam conditions to 3,500 psig and 1,050F.

Large steam turbine generating units today have an impressive re-

Featured

liability record, C. D. Wilson, Allis-Chalmers Mfg Co, said. Average system availability record is over 90% and still improving, although unit capability and steam conditions are greatly increased from what they were only a few years ago. This improvement, he said, has been due largely to the development of modern design, manufacturing, and installation principles by manufacturers and the careful observance of the best operating practices, including preventive maintenance, by utilities.

DISCUSSING high-voltage systems are, l to r, C. F. Wagner, J. E. O'Neil, both Westinghouse, L. M. Robertson, PS of Colorado, A. R. Hileman, Westinghouse

Advances in Cooling Cited

Conductor-cooled generators have performed excellently since the 1951 installation of the first unit, reported L. M. Abrahamson, Wisconsin P&L Co, and L. T. Rosenberg, Allis-Chalmers. Although there were some slot channel failures and a tripout due to a loose bushing barrier, no outages can be ascribed directly to conductor cooling principles in the 60-Mw unit at Edgewater Station of the Wisconsin utility.

Short core lengths and reduced weight of units with conductor cooling hold foundation and crane costs down. The machines have high reactances, similar to those of 1,800-rpm machines, so that fault currents and the interrupting duty of switchgear are reduced.

Inner cooling has been successful with 55 generators without serious failures of any component of the ventilating system. The first generators with inner cooling on both rotor and stator began operation in January 1954 at Niagara-Mohawk Power Corp's Huntley Station. Its six-year performance record was presented by O. K. Brown of that utility and J. W. Batchelor, Westinghouse. Operation was mostly routine, and none of the reported troubles has been directly attributed to inner cooling.

But in some instances, higher excitation currents associated with inner cooling were contributory factors. To date 98 generators, totaling 23 million kva of capability, have been built or are on order, the largest being 422 kva. No major changes have been made in design.

Since the first liquid-cooled turbine-generator was started, March 1956, at Cleveland's Eastlake Station, 11 others aggregating 3-million kva of capability, have been put in service, ten more have been shipped, and 33 are on order, reported C. E. Kilbourne and C. H. Holley, General Electric.

Among 12 operating units, there were only two forced outages, both attributed to the "growing pains" of liquid cooling.

Availability of the units has been 98.67%. No leak has occurred inside a main generator housing during normal machine operation. Liquid cooling has made substantial increase of generator output possible without adding to frame dimensions or weight. The Eastlake unit, originally rated 260 Mva, has been rerated to 305 Mva. The authors predict that a generator frame that produced 162 Mva in 1951 and today handles 384 Mva, will deliver 500 Mva with water cooling in a few years.

Two large coal storage piles were inventoried by a probe containing gamma radiation with a radiation detector and a preamplifier, reported B. B. Bonadio, Indiana-Kentucky Electric Corp, A. S. Grimes, American Electric Power Co, and H. I. Lamphier, Ohio Valley Electric Corp. Gamma radiation returning to the detector varies with the density of the coal. A similar probe measures moisture content of the coal, but its results are not consistent.

Dresden Nears Full Power

Dresden Atomic Power Station, expected to be at 50% power by the end of April, may reach full power by summer, J. J. Poer, Commonwealth Edison Co, and V. D. Nixon, General Electric, told the APC.

Control-rod drives have been successfully modified to reduce inertial forces that led to repeated failure of shear pins linking drive and poison sections of control rods earlier. Two principal causes of the shearing were discovered by extensive testing. One was loss of buffering action at the end of the scram strokes because of damaged seal rings. The other was too rapid deceleration of the control rod entering the buffering region. All damaged seals have been replaced,

(*Continued on page* 188)

Industrial System Design Aims for

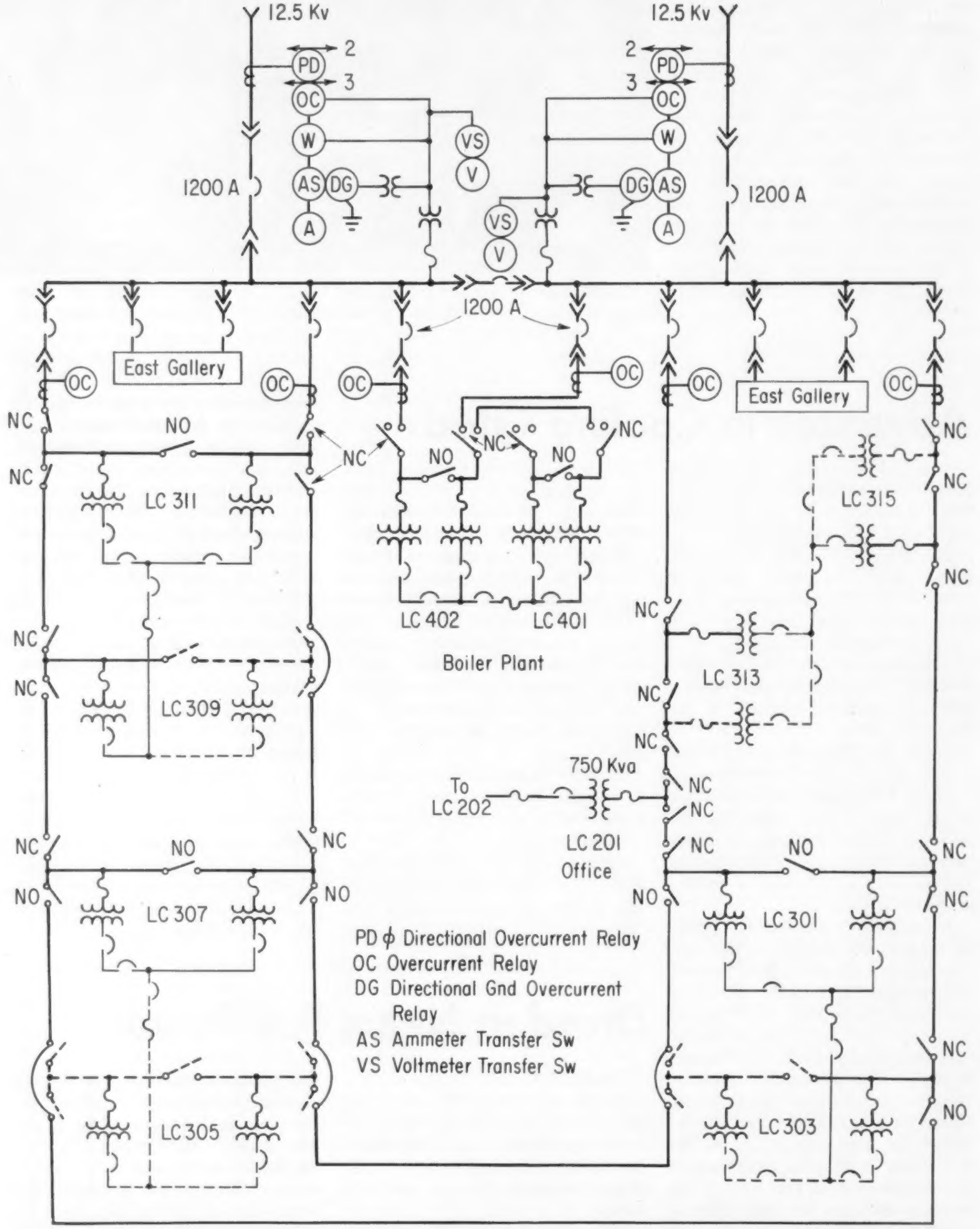

12.5 Kv
12.5 Kv
2
3
PD
OC
W
VS
V
AS
DG
A
1200 A
1200 A
1200 A
East Gallery
East Gallery
OC
NC
NO
LC 311
LC 402
LC 401
Boiler Plant
LC 315
LC 313
LC 309
750 Kva
To
LC 202
LC 201
Office
LC 307
LC 301
LC 305
LC 303
PD ϕ Directional Overcurrent Relay
OC Overcurrent Relay
DG Directional Gnd Overcurrent Relay
AS Ammeter Transfer Sw
VS Voltmeter Transfer Sw

FIG 1. TWO LOOP FEEDERS serve west manufacturing area. Similar system serves east side. Interrupter switches in each load center permit supply from either feeder. Boiler house transformers are 1,000 kva; all others, 750 kva

High Continuity, Easy Growth

Twin loop feeders, secondary ties, and ample transformer capacity assures service continuity. Design includes provisions for additional load centers as load grows

Excellent reliability and a high degree of flexibility for future load increases are exemplified by the distribution system in the Western Electric Co's new Oklahoma City plant. Supply to the loads can be maintained despite loss of a utility line, main transformer, in-plant primary feeder, or secondary sub.

Power facilities in the manufacturing areas can be modified to handle a 50% increase in load without changing the distribution design. A series of double-ended and single-ended load center substations, located on the galleries above the manufacturing areas, limit the amount of load loss due to any single transformer failure. Two loop feeders, Fig 1, each with one sectionalizing switch open, provide four different ways of energizing each load center substation.

Use Secondary Ties

Secondary ties between each bank of the double-ended substation and between adjacent load centers provide alternate means of supplying load in case of a transformer failure. Similar reliability is provided for the office building and the boiler room supplies. Scheduled for occupancy in the spring of 1960, the plant will have a demand of slightly more than 10,000 kva when it goes into full production.

Two overhead 69-kv lines from the Oklahoma Gas & Electric Co system feed the main substation, on the edge of the plant site. A motor-operated throw-over switch permits supply from either of the two circuits in case trouble develops in the other. The 69-kv supply will be stepped down to 12.5 kv, for the in-plant primary distribution circuits, by two 7,500-kva transformers. At present, only one of these transformers has been installed, Fig 2. Either of the transformers can handle the load under emergency conditions, although the transformer will have to carry some overload.

From the main substation, two 12.5-kv underground circuits run to the plant service building. Each circuit is in fiber conduit, encased in concrete. Each circuit is in a separate duct run and duct runs are in separate trenches. This minimizes the chance of trouble on one circuit involving the other circuit. Where cables are in common manholes, they are separately fireproofed.

Three one-conductor, 900-MCM aluminum conductor cables, each in a separate conduit run, are used for each circuit. The neutral is imbedded in the concrete of the duct run. Three spare conduits in each duct run facilitate cable replacement.

At the 69-12.5-kv substation, the 12.5-kv cables terminate in a metering house where service disconnecting is provided by metal-clad load-break interrupter switches. Overcurrent protection for the 12.5-kv cables is provided in the power company's substation. There is no overcurrent protection in the metering house. However, overcurrent protection is also provided at Western Electric's service building, the other termination of the 12.5-kv cables.

The distribution switchboard in the service building, Fig 3, is double-ended with five 300-amp, 12.5-kv feeders from each end of the board. Overcurrent protection for these circuits is provided by extreme inverse time relays with instantaneous attachments. On branches of these same circuits, overcurrent protection is by very inverse time relays. All relay settings on the Western Electric distribution system are coordinated with those of the power company system.

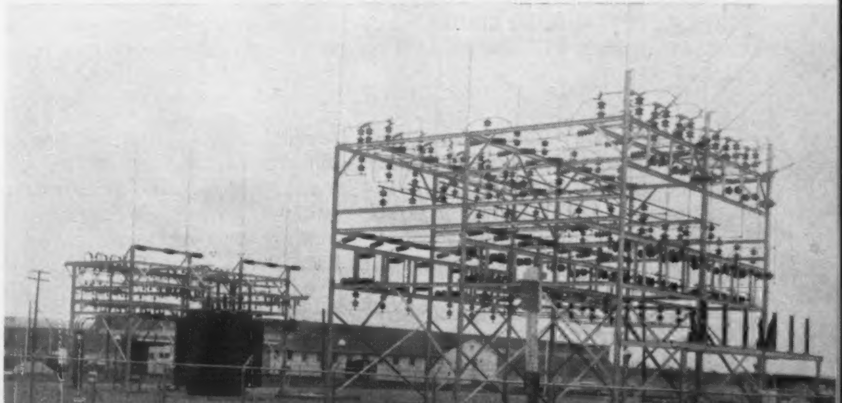
The 12.5-kv feeders from the distribution switchboard will be loop operated. A feeder from one end of the switchboard loops back to the other end of the switchboard. Various sectionalizing switches provide for manual isolation or changes in the direction of feed of transformers serving the plant loads. One manually-operated disconnect switch in each loop is normally open.

The ten 12.5-kv circuits from the main switchboard feed load centers in two galleries above the manufacturing areas. The 12.5-kv feeders are aluminum conductor, shielded, PVC jacketed cables in conduit.

There are five load centers in each gallery with provisions for a sixth in the future. Fig 1 shows the load centers in the west gallery. A similar arrangement is used in the east gallery.

Three of the load centers are double-ended; two are single-ended. The two single-ended load centers can be converted to double-ended installations as power requirements increase. Doubling the capacity of

FIG 2. **SUBSTATION SERVING PLANT** is fed by two 69-kv utility lines, with motor-operated throwover switch. Ultimately, sub will have two 7.5-Mva transformers, each of which can handle all plant load, with some overloading



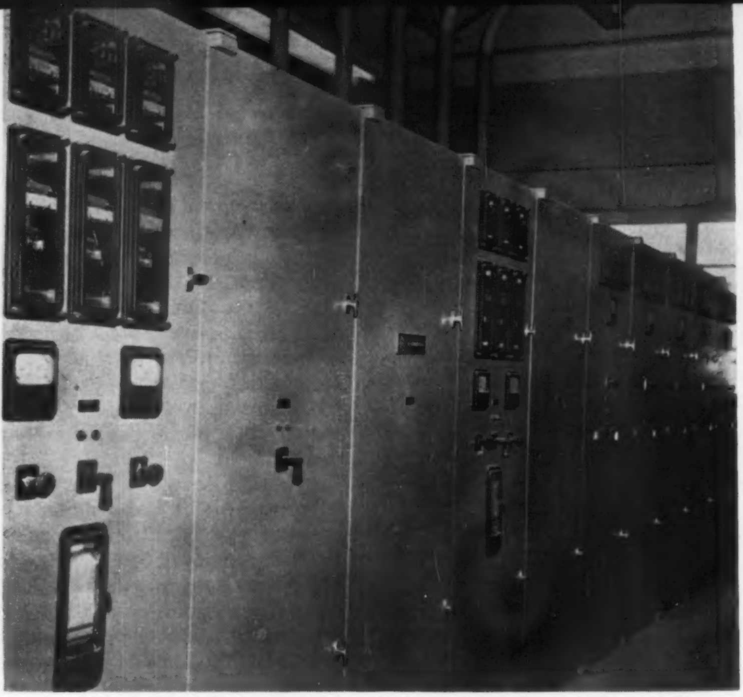


FIG 3. **SWITCHBOARD IN SERVICE BUILDING,** fed by two underground 12.5-kv circuits from main sub, has five 12.5-kv feeders from each end of board

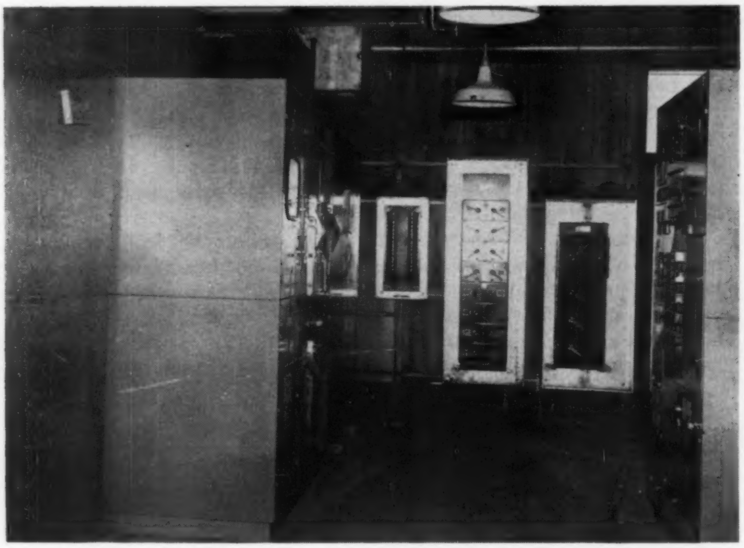


FIG 4. **TYPICAL LOAD CENTER** has two 750-kva dry-type transformers to step 12.5-kv down to 277/480 v. Center can be fed from either of two loop feeders

the single-ended load centers plus the addition of another load center in the space provided for it will accommodate a 50% growth in power use in the manufacturing areas.

All transformers in the galleries serving the manufacturing areas are 750-kva, 12.5-480-v sealed dry-type units. A typical installation is shown in Fig 4. Any of these load centers can be supplied from two different 12.5-kv loop feeders. Each load center includes five interrupter switches, arranged so that:

- Any load center can be isolated from both feeders;
- Either load center can be fed from either feeder;
- Both load centers can be fed from either 12.5-kv loop feeder.

Drawout air circuit breakers are used to connect the secondaries of each double-ended load center. In addition, the secondaries of each pair of load centers are connected by tie breakers and current limiting fuses. Although bus tie breakers are not provided for single-ended load centers, complete provision for their future insertion is made.

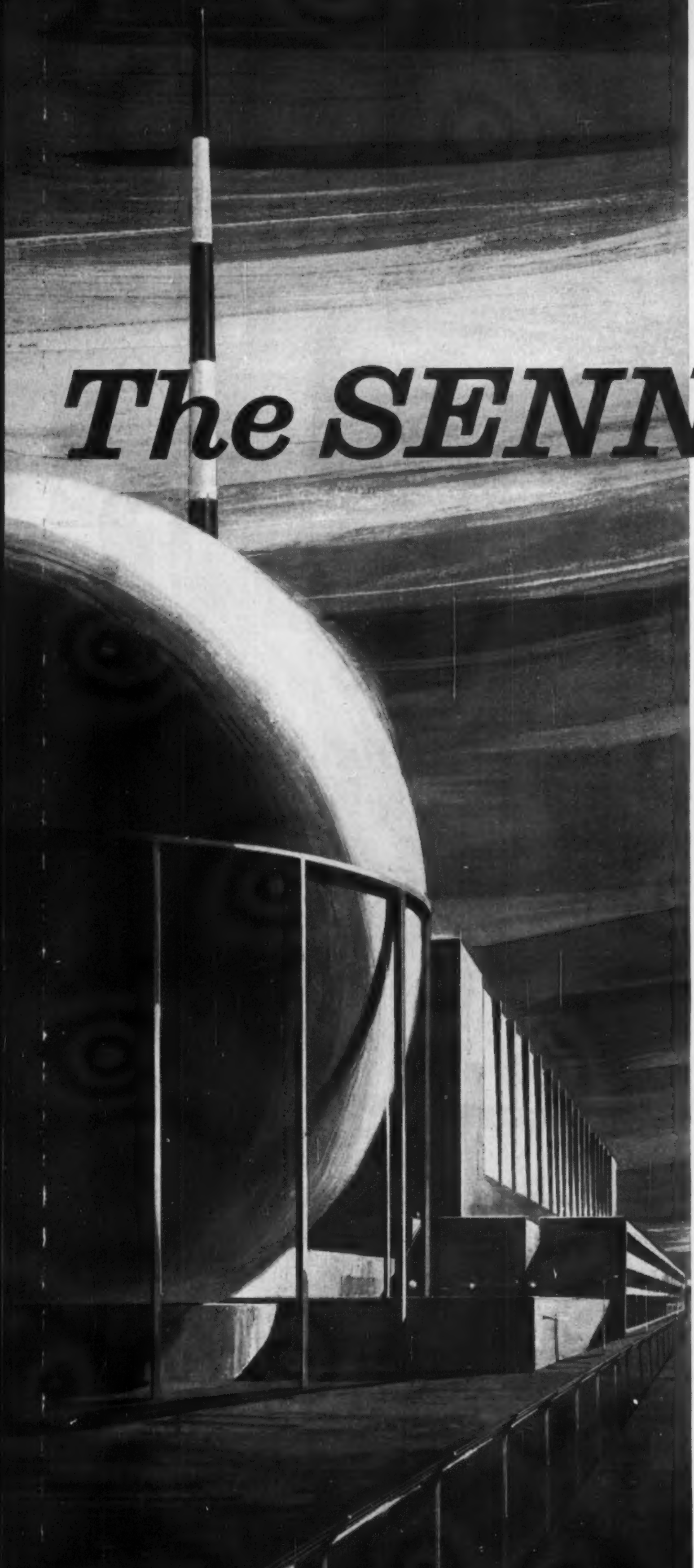
The high bay area of the plant, which houses the warehouse and shipping areas, is served by four load centers, located in the penthouse above the high bays. Three of these load centers are single-ended; one is double-ended.

The two double-ended load centers serving the boiler house load are each rated 1,000 kva. As indicated in Fig 1, this area is also served by two 12.5-kv feeders. Similarly the two 750-kva centers in the office area can be served from either of two loop feeders.

The 277/480-v secondaries emanating from the load centers are interlocked armored cables in trays. Cable trays are used, both in the load center rooms and in the trusses of the building, for cables serving distribution and power panels and plug-in bus duct. Interlocked armored cable is also used to serve contactors for the 277-v lighting in the manufacturing building. In the manufacturing areas, plug-in bus duct was used for secondary distribution because of its flexibility in meeting production line changes.

While a very high degree of service reliability has been built into the power supply facilities for this plant, a 500-kw diesel-engine generator has been installed for emergency service. This generator has only enough capacity to provide the necessary protective services for safe evacuation of the plant.

The new Oklahoma City plant will manufacture automatic dial switching equipment for the Bell Telephone System. The plant was designed by Charles T. Main Inc of Boston, under the direction and in conjunction with Western Electric Co Plant Design and Construction Division. Huber, Hunt and Nicholas, of Indianapolis, are the constructors. R. W. Paul is Western Electric Co's project engineer on the job site and L. V. Randle is the Western Electric Co electrical engineer on the project. Construction was started in December of 1958.



Progress toward lower generation costs
via the Boiling Water Reactor

The SENN Story

Garigliano Nuclear Power Plant design more than 30% complete—construction under way

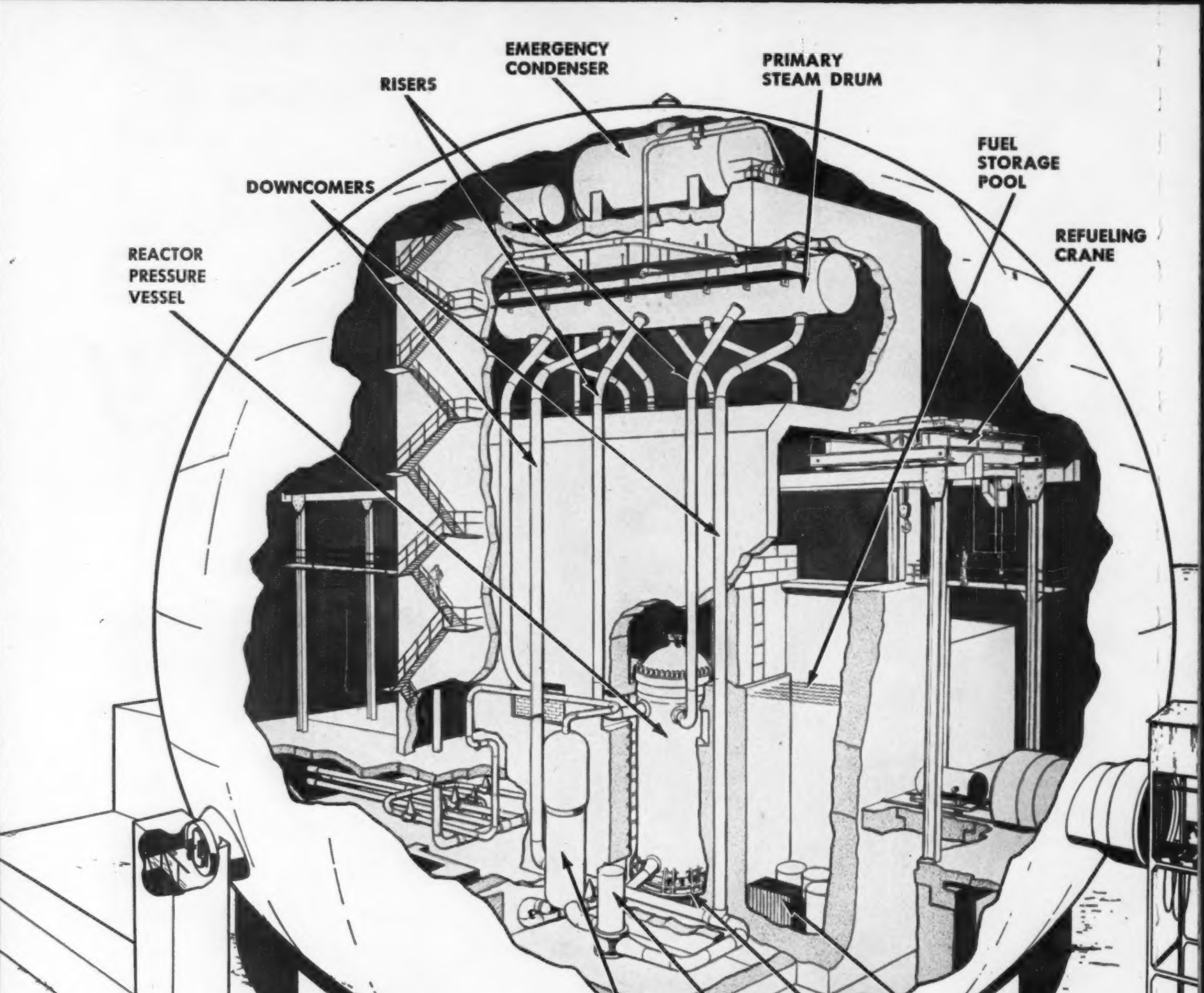
General Electric Boiling Water Reactor—of established design—selected over 8 other systems for Italy's Garigliano Plant because of high operating flexibility, good potential for improvement, lowest cost power production.

Progress Is Our Most Important Product

GENERAL ELECTRIC

U. S. A.

The SENN Story: *established design keeps*


EMERGENCY CONDENSER
RISERS
PRIMARY STEAM DRUM
FUEL STORAGE POOL
DOWNCOMERS
REFUELING CRANE
REACTOR PRESSURE VESSEL
FUEL STORAGE RACK
RECIRCULATING PUMP
CONTROL ROD DROVES
SECONDARY STEAM GENERATOR

Construction timetable

1959: Contract awarded to International General Electric Operations, S.A. Initial design and construction plans established and work begun at site.

1960: Foundations complete and sphere erection started. Nuclear system design complete.

1961: Sphere erection complete. Reactor pressure vessel fabrication complete.

1962: Pressure vessel installation complete. Nuclear steam supply equipment installed.

1963: First core loading. Plant operational.

SENN construction on schedule

Construction of Europe's first large boiling water nuclear power station, the SENN (Societa Elettronucleare Nazionale) 150,000-kwe Garigliano Plant, is already on schedule because of the established design of General Electric's Boiling Water Reactor. This reactor was selected over eight others because it will produce lower cost power, has high flexibility and good potential for future improvements.

Site preparation for this plant is well under way on the south bank of the Garigliano River, near Naples, and piling for the reactor structure is complete—fully a month ahead of schedule. Piling for the turbine building is proceeding on schedule for completion by July 1.

Flexibility in operation makes the boiling water reactor the outstanding type for power generation, both in normal operation and in response to network load demands. Designed to respond instantly to load changes, reactor power follows turbine load demands without necessity of control rod movement for load changes from 2/3 power to rated load.

Potential for future improvements, as a result of further strides in nuclear technology, is built into the boiling water reactor design. New, improved fuels can be utilized. The entire core may be readily removed and replaced. Further advances in reactor technology may permit increased specific power thereby reducing unit cost of total power produced.

SENN is another step in General Electric's continuing program toward economical nuclear power with the boiling water reactor. It is based on the established design technology of the Vallecitos Boiling Water Reactor and the Dresden Nuclear Power Station. Because of this foundation, SENN will be a proven system consisting of proven components when it goes "on-the-line" in 1963.

For further information, contact your nearby General Electric Apparatus Sales Office or write to General Electric Company, Schenectady 5, N. Y. Outside the United States and Canada, write to International General Electric Company, 150 East 42nd Street, New York 17, N. Y.

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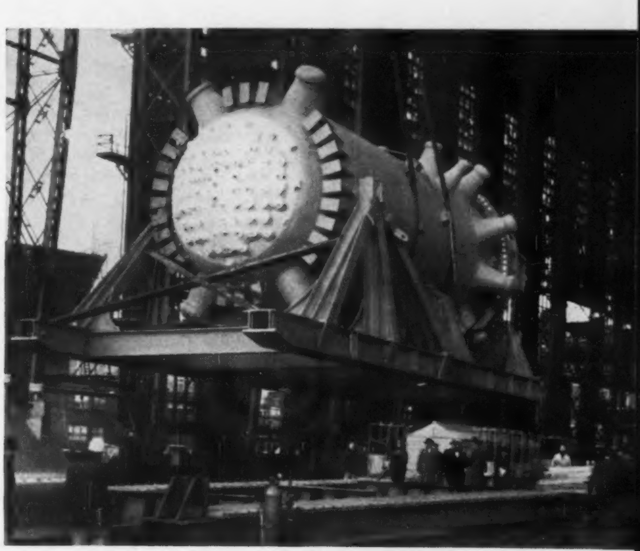
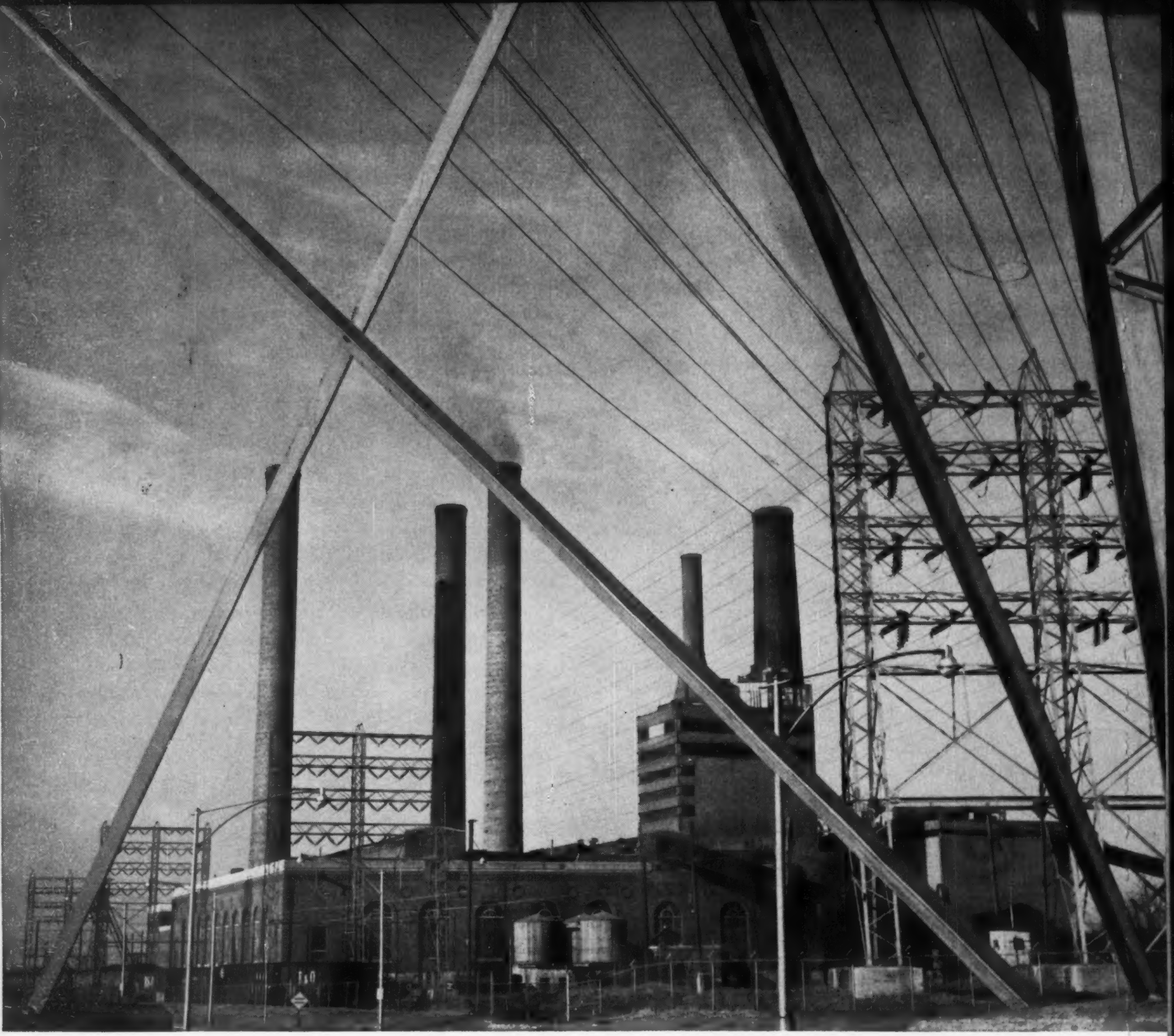
GENERAL ELECTRIC

U. S. A.

PILE-DRIVING OPERATIONS and the pile test program are under way at the site of the reactor containment sphere at SENN.



HUGE PRESSURE VESSEL for the Garigliano Plant, similar to the Dresden pressure vessel (above), is now being manufactured.



Toledo Edison Company's Acme Plant at Toledo, Ohio, where 7 turbine generators can produce a total of 382,000 kw to serve the Toledo area.

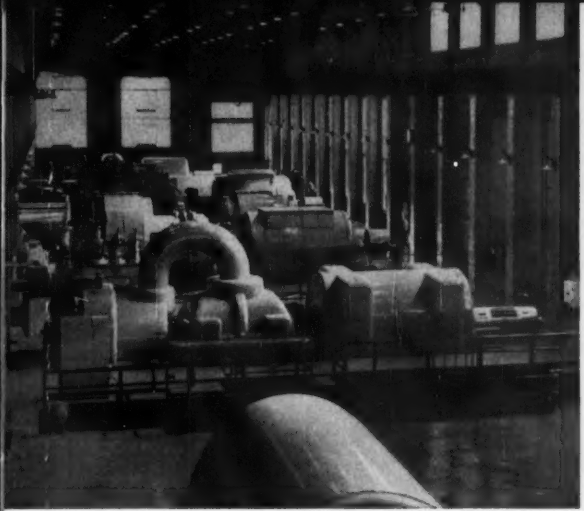
Toledo Edison finds Gulfcrest oil still

GULF MAKES THINGS

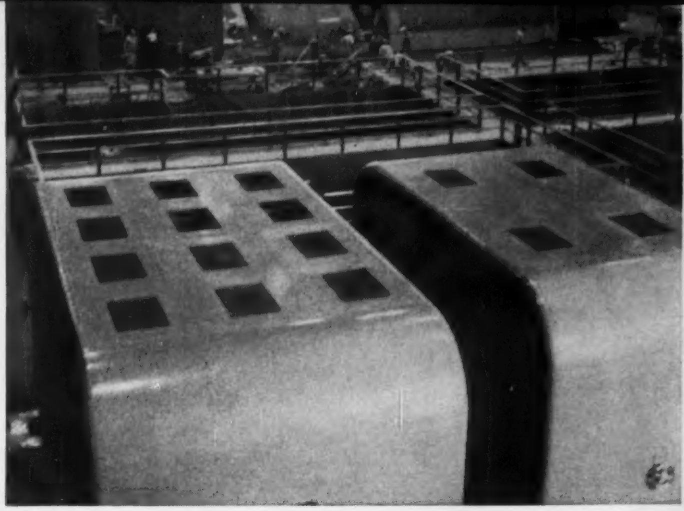
Eighteen years ago, Toledo Edison chose Gulfcrest turbine oil as the fill for all 7 generators at their Acme Plant in Toledo. Fifteen years later, in 1956, they again chose Gulfcrest for the first of two 135,000 kw units at their new $52-million Bay Shore Station at Harbor View, Ohio.

Recently they saw laboratory proof that Gulf makes things run better—with this long-lasting, anti-rusting, non-foaming turbine oil. In a direct comparison between the 3-year-old Gulfcrest at Bay Shore Station and the 18-year-old Gulfcrest at the Acme Plant, Toledo Edison found that the Gulfcrest oil in both systems was still within the original specifications for new oil. Here's what laboratory analyses showed:

	Oil After 3 Yrs. Service	Oil After 18 Yrs. Service
Color, ASTM Union	2.0	1.75
Flash point, °F.	425	425
Appearance	Bright	Bright
Water, % by volume	0	0
Viscosity, SSU at 100°F.	152.4	151.5
Neutralization	.03	.05
Interfacial tension, dynes per cm at 77°F.	35	29
Steam emulsion number	160	153
Rust prevention test, ASTM D 665, Procedure A	Passes	Passes



Gulfcrest oil has lubricated the turbine generators at the Acme Plant for over 18 years with only slight changes in original specifications. All 7 turbine generators at this plant are lubricated with Gulfcrest.



Twin Westinghouse turbine generators at Toledo Edison's Bay Shore Station. Both are 135,000 kw units. Each has a fill of 5050 gallons of Gulfcrest. New unit went on the line early in 1959.

Toledo Edison runs lab tests on their used Gulfcrest oil every 30 days. Yearly, samples are sent to Gulf Refining Technology Laboratories in Philadelphia for more complete analysis.

James Grant, left, Chief Chemist at Toledo Edison, with Gulf Sales Engineer E. A. Jeffery, who has been providing lubrication counsel to Toledo Edison since 1941.

"like new" after 18 years' service . . .

RUN BETTER!

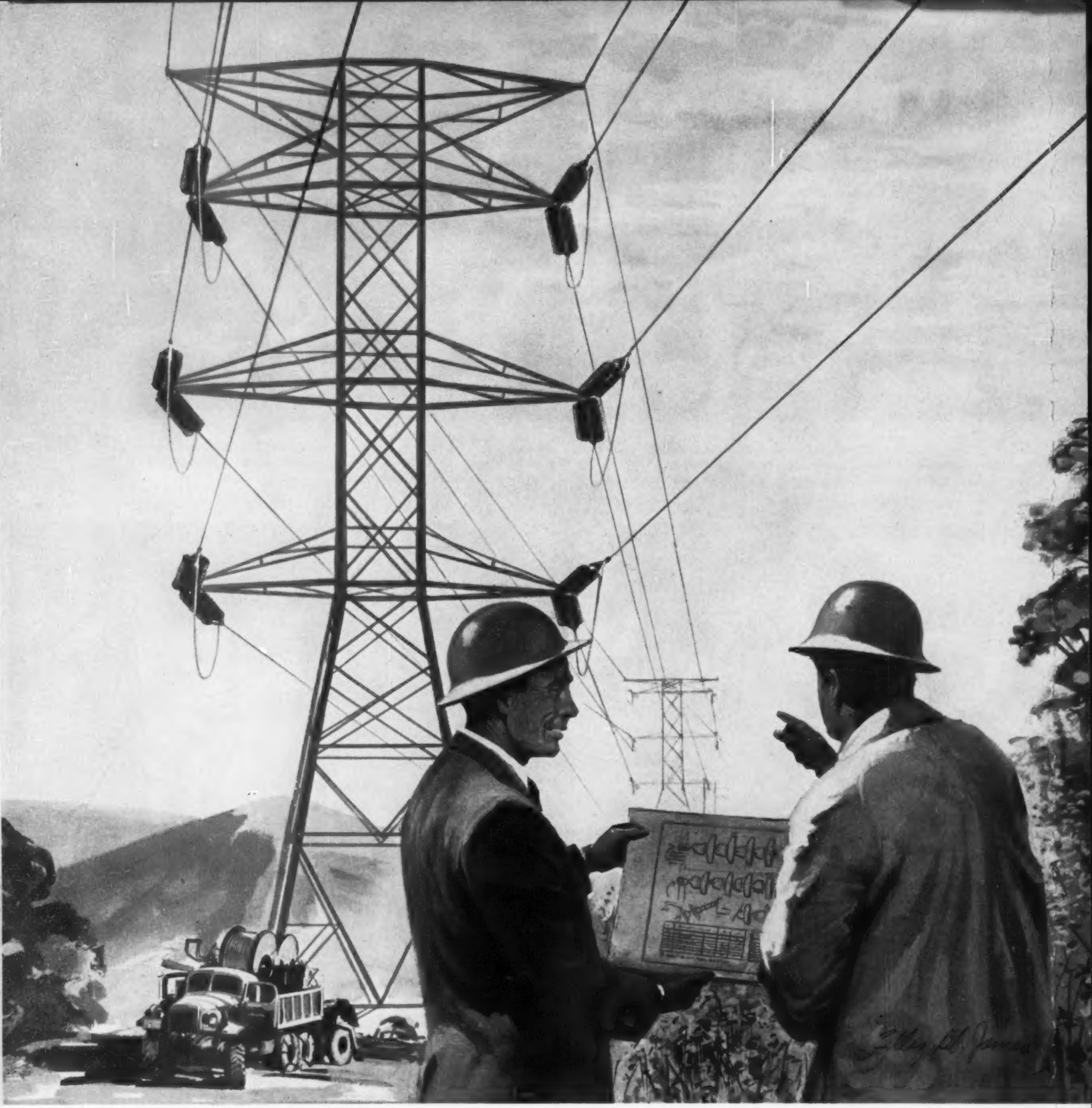
With such a performance record, Gulfcrest was the natural choice of Toledo Edison last year, when they installed their second big Bay Shore Station turbine generator—a twin to the 135,000 kw unit installed in 1956.

Every performance record of Gulfcrest proves that Gulf makes things run better. In many large turbine generators Gulfcrest has served continuously for more than 20 years with neutralization numbers still low, systems still free from sludge and rust. Small wonder that in Gulf's marketing area, more power is generated by central station steam turbines lubricated with Gulfcrest than with any other oil.

More information? Just call your nearest Gulf office, or write for illustrated booklet.

GULF OIL CORPORATION
Dept. DM, Gulf Building
Pittsburgh 30, Pa.

GULF



INTEGRITY

Thirty-two VICTOR No. 924, 25,000 lb. suspensions (EEI-NEMA 52-5) yoked in two strings of sixteen each, carry the strain of this angle tower of Consolidated Edison's Yonkers to Millwood, N. Y. transmission line.

Design that has been proven in thousands of installations . . . quality controlled manufacturing that maintains complete uniformity of product . . . conscientious testing procedures that insure conformance to VICTOR's high standards . . . these are the reasons for VICTOR's enviable reputation for reliability of product and integrity of purpose.

Best evidence of this integrity of purpose is the fact that VICTOR insulators consistently proof-test in excess of their EEI-NEMA ratings. You get more for your money by choosing VICTOR. For catalog, specifications and prices, contact your nearby VICTOR sales office, Victor Insulators Division, I-T-E Circuit Breaker Company, Victor, N. Y.

I-T-E

I-T-E CIRCUIT BREAKER COMPANY

Procurement & Products

COAL ▶ **Key to meeting coal requirements on an economical basis** over the next 10 to 15 years "lies in a combination of the long-term coal contract, backed up with dedicated coal reserves, and volume movement agreements with the railroads," said R. E. Salvati, president, Island Creek Coal Co, in a recent address. "Such a combination," he said, "represents the type of big thinking required for the job ahead."

New factor in the coal market will be an increasing demand by electric utilities in eastern Canada. Coal requirements, much of which will be met by U.S. suppliers, will rise from 135,000 tons this year to 7.4 million tons in 1970 for Ontario Hydro-Electric Power Commission.

Tampa Electric Co lost another round in its battle to validate a long-term coal contract with the Nashville Coal Co, now a subsidiary of the West Kentucky Coal Co. An appeals court in Cincinnati recently upheld a lower court decision ruling the contract invalid. It is not known whether a further appeal will be made.

DELIVERY ▶ **Normal shipment time of medium transformers has been reduced** approximately 20% with the addition of computer designing to existing repetitive manufacturing procedures, General Electric Co reports. The computer-designed transformers are also said to embody several basic improvements over previous designs.

FOREIGN ▶ **Continual pressure from foreign sources** could force U. S. manufacturers to make some components abroad, Westinghouse President Mark Cresap told his annual stockholders meeting in San Francisco recently. But, he said, this would be a most unfortunate trend for American labor and is certainly against our present company policy.

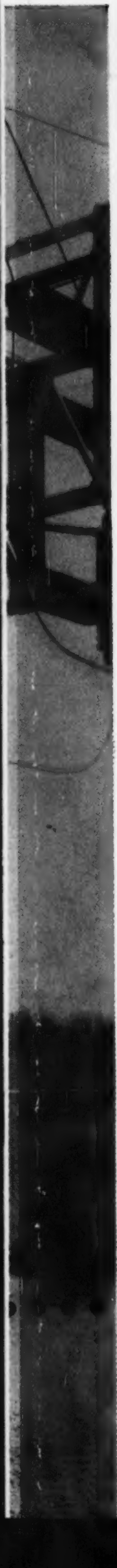
PRICES ▶ **General Electric eliminates price premiums** on selectively coordinated load center unit substations rated 300 kva and above for use on systems up to 600 v. The manufacturer says savings will be $464 to $930 per circuit breaker.

RESEARCH ▶ **Total research and development expenditures** for U.S. industry are expected to rise from $12 billion in 1959 to $22 billion in 1969, an analysis by the McGraw-Hill economics department shows. The prospect is that in 1969 a smaller share of the total will be devoted to government research, and relatively more to industrial and basic research.

News of Manufacturers.................................page 84
New Equipment.................................page 93
Readers Service.................................page 157

Pennsylvania phase-isolated LTC

Transformers offer you the ECONOMY of 3-phase installation plus the QUALITY of single-phase regulation



The Pennsylvania Phase-Isolated LTC Transformer is actually a seven-in-one package. It combines *one* three-phase transformer, *three* single-phase LTC regulators and *three* regulator by-pass assemblies. Though the initial cost is only slightly more than the cost of a conventional three-phase transformer, a real and substantial *overall* cost saving can be made. Installing a phase-isolated LTC transformer requires less space and costs less than a conventional seven-piece installation by an amount equal approximately to the sum of the following:

. . . The cost of extra supports (foundations and switch structures),

. . . The extra cost of handling separate pieces of equipment, including transportation and mounting,

. . . The cost of labor and materials for interconnection between the separate items,

. . . The design cost for the multi-unit layout.

But, installation savings are not the only savings to be realized. Through independent single-phase regulation, distribution circuit capacity can be released and revenue increased.

With independent phase regulation, the maximum and minimum voltage extremes over the three phases can be reduced. This permits heavier loading or longer feeders without exceeding established voltage limits.

With a reduced range of voltage variation, average voltage is higher. This produces an increase in revenue from voltage-sensitive loads.

For further information on the application of Pennsylvania Phase-Isolated LTC Transformers, write on your company letterhead for a copy of descriptive booklet No. 591. Address Power Transformer Sales, Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

McGRAW EDISON

Pennsylvania Phase-Isolated Three-Phase Transformers with 20% regulation in 32 steps are available in the following kva and voltage ratings:

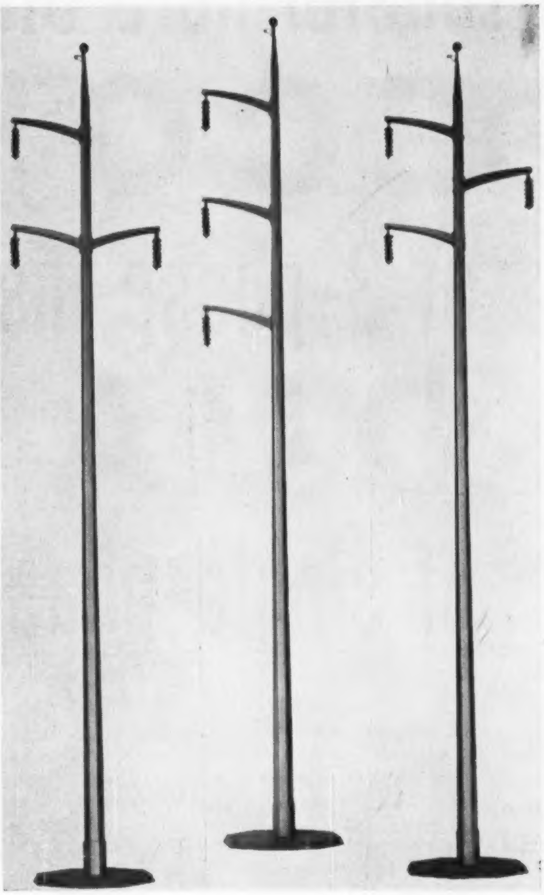
BIL	LOW VOLTAGE	KVA
75 kv	4160Y/2400 or 4360Y/2520 volts	1000 kva thru 2500/3125 kva incl.
95 kv	8320Y/4800 or 8720Y/5040 volts	1000 kva thru 5000/6250 kva incl.
110 kv	12470Y/7200 or 13090Y/7560 or 13200Y/7620 or 13800Y/7980 volts	1000 kva thru 7500/9375 kva incl.

Note: Other voltage and kva ratings can be secured under special conditions.

●● 3750-kva (future FA rating of 4687 kva), Phase-Isolated LTC transformer installation at the New Glarus Substation of the Wisconsin Power and Light Company. Installation is typical for supplying small communities and rural loads. Rating is 67000Δ–13090Y/7560 volts with single-phase automatic LTC regulation in 32 steps covering a range of 20%.

PENNSYLVANIA TRANSFORMERS

L-M Producing 'New Look' Tapered, HV Line Poles

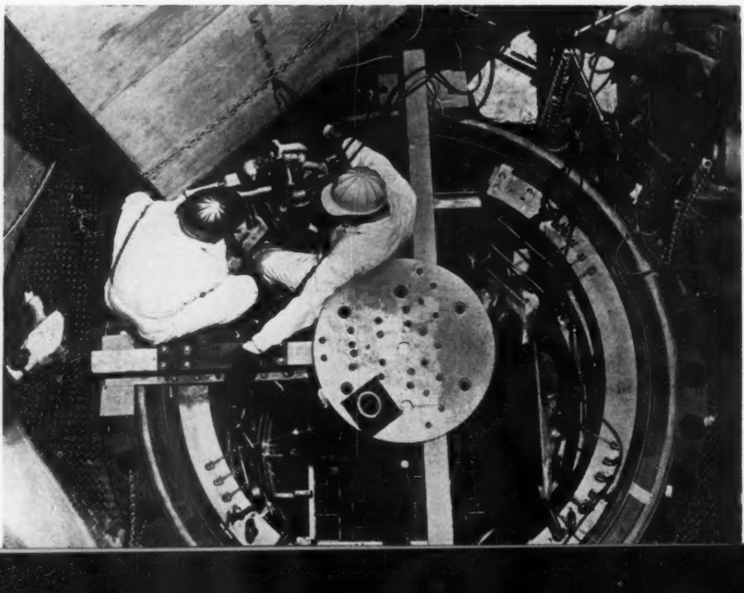


Line Material Industries is planning to produce these tapered, octagonal, welded-aluminum poles (see 5-ft, plastic models, right), with the belief they will fill utilities' need for more esthetic appearance for high-voltage power lines through congested areas.

Preliminary designs shown here were drawn up at the request of Louisiana Power & Light Co by Handley-Brown Co of Jackson, Mich. The 85-ft poles will have 2-ft base width and will support transmission lines up to 230 kv with average spans of 600 ft.

Commented the designer, "We can vary the pole strength to meet most requirements by adding or subtracting a little bit of material at the right spot." Commented spokesman for the manufacturer, "These models present general details of the pole and possible conductor configuration. Many variations will be available. We plan to release engineering data and be in a position to quote prices and delivery in the very near future."

GE Completes Vallecitos Reactor Modification



General Electric technicians (left) are shown completing modification of the Vallecitos boiling water reactor. The reactor fed steam to a Pacific Gas & Electric turbine-generator for 26 months, producing more than 25 million kwhr of electricity for the San Francisco Bay area before being shut down for modification by General Electric last October. Fuel-loading and critical testing of the reactor is scheduled for mid-May, with power production set for June, contingent on obtaining AEC license.

(*Continued on page* 86)

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FOR THE ELECTRICAL INDUSTRY

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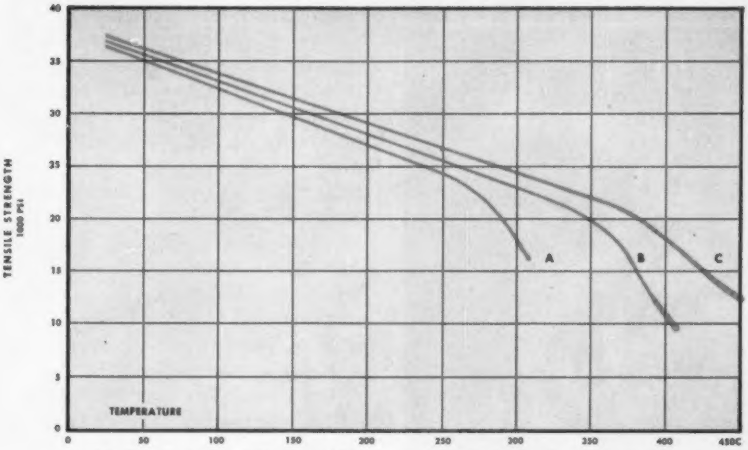

A. Silver content normal. **B.** Silver 8.7 ounces per ton. **C.** Silver 28 ounces per ton.

Silver-bearing coppers give a margin of safety in operating conductors at elevated temperatures

In heavily loaded motors and generators, the windings, collector rings, and commutators must retain their strength at the higher operating temperatures that have become the rule. And there are now many other places where copper conductors must operate at temperatures well above those heretofore considered normal.

Electrolytic copper — with a very small amount of silver added — is superior to any other commercial conductor metal for use at these higher temperatures. Anaconda silver-bearing copper retains the structural design strength of the conductor at the higher operating temperatures. Annealing temperature is raised and softening delayed. The margin of safety is improved. How much gain you can count on is indicated by the chart above.

The curves are the result of tests made by the Metallurgical Research Laboratory of The American Brass Company.

There are three standard Anaconda alloys: Silver Bearing Copper-111, silver 8 troy ounces per ton, average conductivity, annealed, 101%; Silver Bearing Copper-112, silver 10-15 troy ounces per ton, average conductivity, annealed, 100.5%; Silver Bearing Copper-113, silver 25-30 troy ounces per ton, average conductivity, annealed, 100%.

More detailed information concerning the influence of silver on the tensile properties of high-conductivity copper at elevated temperatures is given in Publication C-25, "Anaconda Copper for Electrical Conductors." Included are curves for yield strength at 0.2% offset and 0.5% extension—indices of the limits of elastic behavior—of interest to design engineers.

DO YOU KNOW THESE ELECTRICALCOPPERS?

DLP COPPER-104 (Cu 99.9+, P 0.01) average conductivity, annealed, 97%. High-conductivity type of phosphorus deoxidized copper excellent for brazing, soldering—is being used increasingly by electronics manufacturers—also in such places as transformer bushings.

CHROMIUM COPPER-999 (Cu 99.05, Cr 0.85, Si 0.10) average conductivity, annealed, before heat treatment, 40%; after precipitation hardening, 80%. This unique alloy when precipitation-hardened has very good mechanical properties well above 200 C. This leads to its use, for example, as tips and wheels in resistance welding equipment. Is also regularly used for switch contacts and similar applications at around room temperature.

Electrical conduit and raceways of tough, nonmagnetic Everdur guard circuits from corrosion, vibration

Where power, control, or signal circuits must be buried, hidden, or protected from severe corrosive conditions and vibration, electrical conduit or seamless raceways of Everdur® give enduring protection. Everdur, Anaconda copper-silicon alloy, offers not only unusual resistance to corrosion, but also high strength and resilience to withstand movement, vibration, abrasion, and rough use. In addition it is nonmagnetic, providing electrical advantages. For complete information write for Publication E-12.

5071

BELOW: Railway motor commutator segments, having precise taper and contour, made of Anaconda Silver Bearing Copper-113.

RIGHT: 90-degree bends made in 3", 3½", and 4" Everdur raceways.

IT'S *what's behind* THE BALL THAT COUNTS!

...and Bituminous, too!

BEHIND BITUMINOUS is unlimited supply and ever increasing technology of utilization. *No other usable power source is backed by both these important characteristics.*

You can base your constant power-fuel needs on bituminous with confidence—B&O Bituminous, of course! **Ask our man!**

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BALTIMORE & OHIO RAILROAD
BITUMINOUS COALS FOR EVERY PURPOSE

(*Continued from page* 84)

The reactor is used primarily by General Electric's atomic power equipment department, San Jose, to check reactor designs and concepts. Information gained when it was completely disassembled during modification is expected to prove valuable to reactor designers. After shut down, the over-all reactor was found to have a low radiation level which eliminated the need for overall system decontamination and enabled modification crews to work on reactor components without unusual radiation precautions. This low radiation level was attributed to the fact that a boiling water reactor is partly a self-decontaminating system, purging itself of much radioactivity by water-to-steam separation during operation.

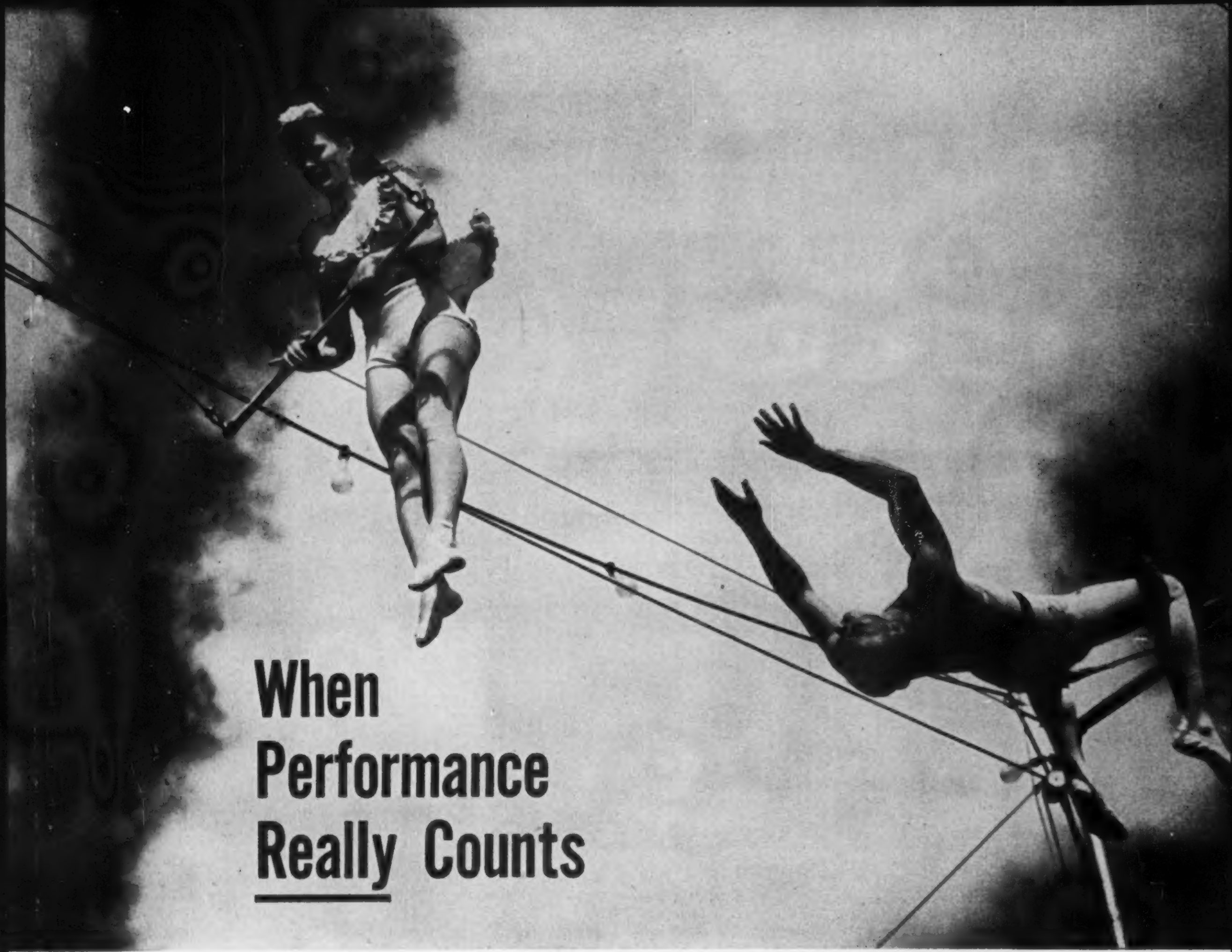
Ion exchangers and the filtration system used in the Vallecitos reactor to remove foreign material also proved particularly effective, says George White, general manager of GE's atomic power equipment department. Although the reactor was operated for almost 1½ years with intentionally ruptured fuel elements, there was little evidence on the bottom of the reactor of the 200 grams of uranium dioxide fuel lost by these defective fuel elements.

Only one minor material failure was uncovered during disassembly: the stainless steel liner covering the flanges of the pressure vessel was cracked. The carbon steel pressure vessel is completely lined with stainless steel to protect it from corrosive effects of water circulating through the reactor. Except for the flanges, this lining is a bonded cladding, unaffected by the failure. The cracks did not penetrate into the carbon steel of the pressure vessel flanges, so there was no danger of damage to the reactor. Cracks in the stainless steel were small.

In reassembling the reactor, new flange liners of Inconel and carbon steel were used. These were not plug-welded, and expansion problems are not anticipated.

The modified Vallecitos boiling water reactor will allow GE to conduct new experiments designed to extend the useful life of nuclear fuel and to test reactor cores they are developing. New features incorporated in the modified reactor are: (1) Capability of employing internal

(*Continued on page* 88)



• Southwire Galvanized Steel Strand

STRAND SIZE	⅝"	½"	7/16"	⅜"	5/16"	9/32"	¼"	3/16"
WEIGHT PER 1000′	813 lb.	517 lb.	399 lb.	273 lb.	205 lb.	164 lb.	121 lb.	72.9 lb.
MINIMUM BREAKING STRENGTH IN POUNDS								
ASTM A-122-54T								
Galvanized (Single Galv.) Common	11600	7400	5700	4250	3200		1900	1150
Class A (Double Galv.) Common	11600	7400	5700	4250	3200		1900	1150
Class A (Double Galv.) Siemens-Martin	19100	12100	9350	6950	5350	4250	3150	1900
Class A (Double Galv.) High Strength	29600	18800	14500	10800	8000	6400	4750	2850
Class A (Double Galv.) Extra High-Strength		26900	20800	15400	11200	8950	6650	3990
Class A Utilities Grade, A.T.&T. and Western Union Spec.—7-wires		25000	18000	11500	6000*	4600		2400**
ASTM A-363-55T (No welds)								
Weldless High-Strength		18800	14500	10800	8000			
Weldless Extra High Strength		26900	20800	15400	11200			

*weight per 1000′—225 lbs. **weight per 1000′—80.3 lbs.

Trapeze artists defy death to please the crowd, but they never take chances with faulty equipment. Care beats dare by far.

So it is with Southwire Galvanized Steel Strand. Manufactured under stringent standards of quality control, it meets or exceeds applicable ASTM specifications . . . is preformed to eliminate flared ends when sheared. Quality extends even to reels which are premium non-returnable type. Comes in 250′, *500′, and 1,000′ coils, and in 2,500′, *5,000′ and 5,280′ reels. Special packaging to meet your requirements is available.

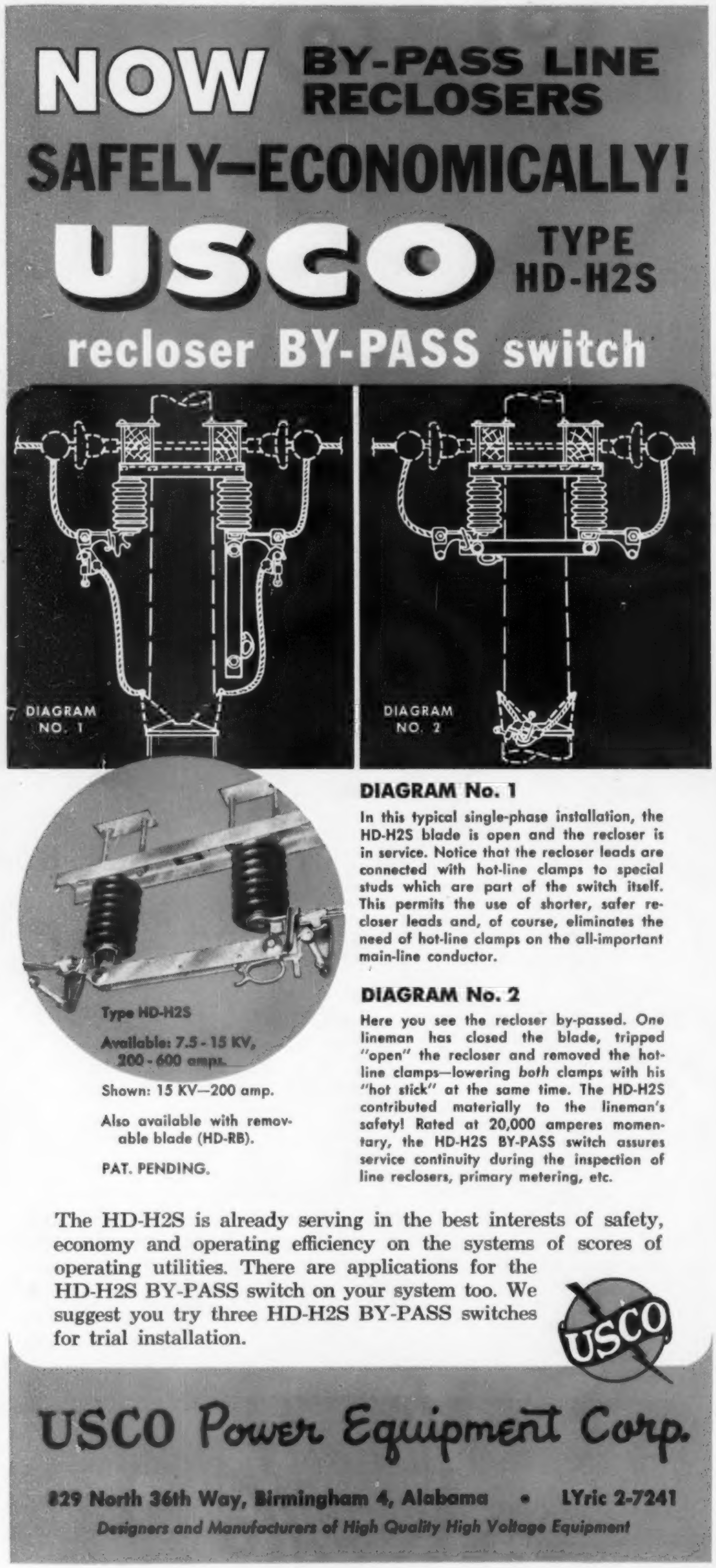
Specify Southwire Galvanized Steel Strand for ground, messenger and guying applications and be sure of quality.

**Stock items*

- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and VWP (Vinyl) Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories
- NM Sheathed Cable
- THW Building Wire
- ALSO FABRICATORS OF COPPER AND ALUMINUM FOR WIRE AND CABLE MANUFACTURERS

Southwire Company

Carrollton, Georgia—TErrace 2-6311



NOW BY-PASS LINE RECLOSERS

SAFELY—ECONOMICALLY!

USCO TYPE HD-H2S

recloser BY-PASS switch

Shown: 15 KV—200 amp.

Also available with removable blade (HD-RB).

PAT. PENDING.

DIAGRAM No. 1

In this typical single-phase installation, the HD-H2S blade is open and the recloser is in service. Notice that the recloser leads are connected with hot-line clamps to special studs which are part of the switch itself. This permits the use of shorter, safer recloser leads and, of course, eliminates the need of hot-line clamps on the all-important main-line conductor.

DIAGRAM No. 2

Here you see the recloser by-passed. One lineman has closed the blade, tripped "open" the recloser and removed the hot-line clamps—lowering *both* clamps with his "hot stick" at the same time. The HD-H2S contributed materially to the lineman's safety! Rated at 20,000 amperes momentary, the HD-H2S BY-PASS switch assures service continuity during the inspection of line reclosers, primary metering, etc.

The HD-H2S is already serving in the best interests of safety, economy and operating efficiency on the systems of scores of operating utilities. There are applications for the HD-H2S BY-PASS switch on your system too. We suggest you try three HD-H2S BY-PASS switches for trial installation.

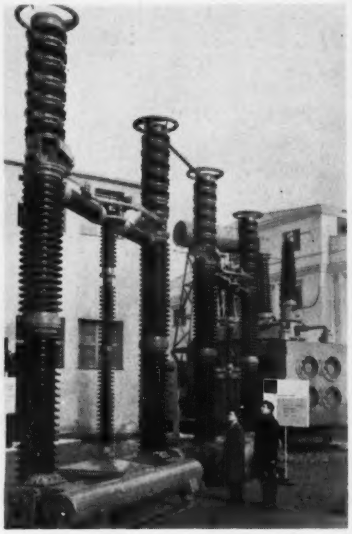
USCO

USCO Power Equipment Corp.

829 North 36th Way, Birmingham 4, Alabama • LYric 2-7241

Designers and Manufacturers of High Quality High Voltage Equipment

natural circulation, forced circulation with variable speed pumps, single and dual-cycle, as well as internal natural circulation. (2) Ability to operate a relatively small core with characteristics similar to a larger power reactor using uranium dioxide fuel. (3) A control system capable of providing long fuel irradiations to 20,000 Mw days per ton. (4) Instrumentation installed in the core for testing fuel designs and core performances.



1960 Leipzig Fair Features Improved Electrical Exhibits

The 380-kv, 15,000-Mva gas-blast circuit breaker (above) was unveiled just in time for display at this year's Leipzig Fair, Bonn, Germany. East German electrical manufacturers showed this and 647 other new and modified versions of equipment, far exceeding their poor showing of other years. Previously, their exhibits had been clumsy and sloppily-produced—in most cases overweight—by western standards. With 55 of their exhibits classified as "peak" units, it is obvious that East Germans have done much since last year to pare surplus weight to an absolute minimum.

The East German electrical industry has been called on by the government to increase production 266% by 1965. During the fair it claims to have booked more than $10-million worth of orders.

AEC Awards Nuclear Fuel Contract to Allis-Chalmers

The Atomic Energy Commission recently awarded a contract to Allis-Chalmers covering initiation of a development program for extruded-ceramic fuel material. The work will be carried out by A-C at its nuclear power department in Washington as part of AEC's multi-million-dollar fuel-cycle development program.

The program, involving development and demonstration of an extrusion process for fabrication of ceramic fuel bodies, is expected to make a major contribution to advanced technology of nuclear fuel fabrication, realizing substantial cost advantages over fuel now used.

A-C says that by employing extrusion techniques it will be possible to manufacture ceramic fuels identical to pressed pellets in cross-section, but considerably longer. Extrusions are not limited in length, but the pressed pellets of uranium oxide or similar non-metallic fuels which are used cannot easily be made longer than four times their diameter. Considerable economical advantage is expected in manufacturing and in handling and loading extruded bodies.

The Ceramic Div of Electric Autolite will conduct portions of the program in a special laboratory at Fostoria, Ohio, as A-C's subcontractor.

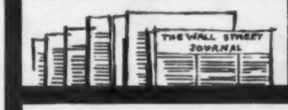
Westinghouse Initiates Distribution Program

Westinghouse initiated a new program to speed product distribution through a modern supply depot placed in service in Columbus, Ohio on April 17. It is part of the company's new nationwide distribution system. Major appliances will be supplied to most U.S. customers from the new 700,000-sq-ft center. Operation will be in effect for a wide range of products by 1965. Spokesman says the new system is expected to reduce Westinghouse inventories in these products by 50%, at the same time providing prompt service to dealers and distributors. The distribution system will decrease by one-third delivery time to dealers.

HOW DO REPUTATIONS GROW?

THE REAL REASONS BEHIND THE FAST-GROWING RESPECT FOR PRECISION TRANSFORMERS

FEATURE ARTICLES HELP!



BUT . . . THE *TRANSFORMER* IS MOST IMPORTANT!

THESE ARE THE GUTS . . .
OF THE PRECISION TRANSFORMER

SPECIAL CORES: Specially designed wound cores, manufactured from highest quality, non-aging cold rolled silicon steel. Processed to obtain the best possible characteristics for top performance and most output per pound.

RIGID CORE CLAMPING: The cores are individually clamped and braced throughout. Complete assembly positively located. Noises are suppressed . . . permanent alignment maintained regardless of shipping shocks.

SPECIAL COIL DESIGN: Coils are wound with large number of cooling ducts. Transformers are designed for low winding temperature gradient permitting large overload capacity. Temperature variations are minimized—there are no hot spots.

LOW IMPEDANCE: This feature means, (1) better regulation . . . (2) overloads with minimum revenue loss . . . (3) elimination of low voltage complaints.

BUSHINGS LOCKED WITH TANK: Bushings don't turn with the bolt when installing transformer. Wet process porcelain means high dielectric and mechanical strength.

EASY IDENTIFICATION: The TAP CHANGER is marked on base and on tap changer indicator for positive identification. It is designed to be easily accessible . . . quick snap action.

NO CONNECTION ERRORS: Low voltage leads are permanently identified to prevent improper reconnections in the field.

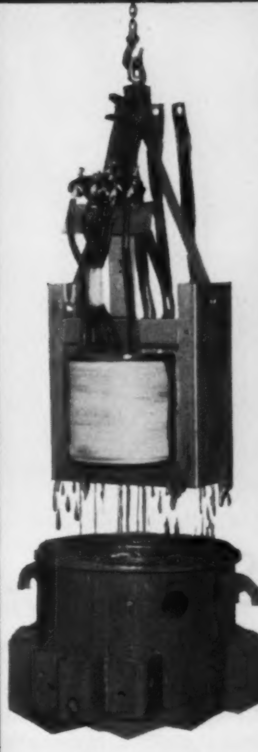
SEEPAGE PROTECTION: All tank seams are automatically welded and pressure tested to assure against seepage.

LEAK PROOF SEAL: Designed with simple, single bolt cover fastening which provides uniform pressure on gasket. Spring action of cover insures leak proof seal.

DURABLE GASKETS: The gasket is made of an oil and askarel resistant material (1) to insure long life . . . (2) to maintain elasticity through wide range of temperature and pressure changes.

MAINTENANCE CUT: A chromate primer is used. Also two coats of enamel are applied — each separately baked and tested to meet the most rigid specifications.

TESTING FOR DEPENDABILITY: Production line impulse assures uniform High Quality. All NEMA and EEI standards and tests are complied with in full.



A Typical, modern design PTC Transformer

PRECISION TRANSFORMER Corp. stands behind all its transformers with the industry's ONLY 5-YEAR Unconditional GUARANTEE.

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TRANSFORMERS
QUIET • EFFICIENT
DEPENDABLE

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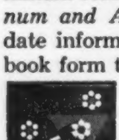
for the latest data on ACSR

5
resistance and reactance of aluminum conductors
5
current-temperature characteristics of aluminum conductors
6
overload and fault current limitations of bare aluminum conductors

126 fact-filled pages...from Alcoa

It took more than 60 years to prepare these three publications.

Recently completed tests have made it possible to review and revise data accumulated since 1897, the year Alcoa launched a continuous research program on overhead aluminum conductors— *both all-aluminum and ACSR*. The most up-to-date information has been put into book form to help you in your job:



Design or operation of transmission lines is your problem. Maybe you're called on to predict the resistance and reactance of a proposed transmission line. Are available data good enough? This 90-page book supplies you with new information on resistance and reactance—information that can help you accurately evaluate the effects of the steel core on electrical characteristics. TITLE: *Resistance and reactance of aluminum conductors.*

How much heat loss can you expect from convection? Tough problem. One that's complicated by the chimney effect of a heated conductor. And varying wind conditions. This 20-page publication provides up-to-date information on heat dissipation caused by convection and radiation. TITLE: *Current-temperature characteristics of aluminum conductors.*

Electrical requirements on your system go up. You need to operate conductors at higher temperatures than in the past. You ask yourself: what about creep effect? Here's a 16-page booklet that provides easy-to-use answers to many questions on how aluminum conductors behave when subjected to various conditions of heating by high overload currents. TITLE: *Overload and fault current limitations of bare aluminum conductors.*

Ask any one of our representatives for your copy of these new publications. Written requests on company stationery should be mailed to Rome Cable Division of Alcoa, Dept. 1-40, Rome, New York.

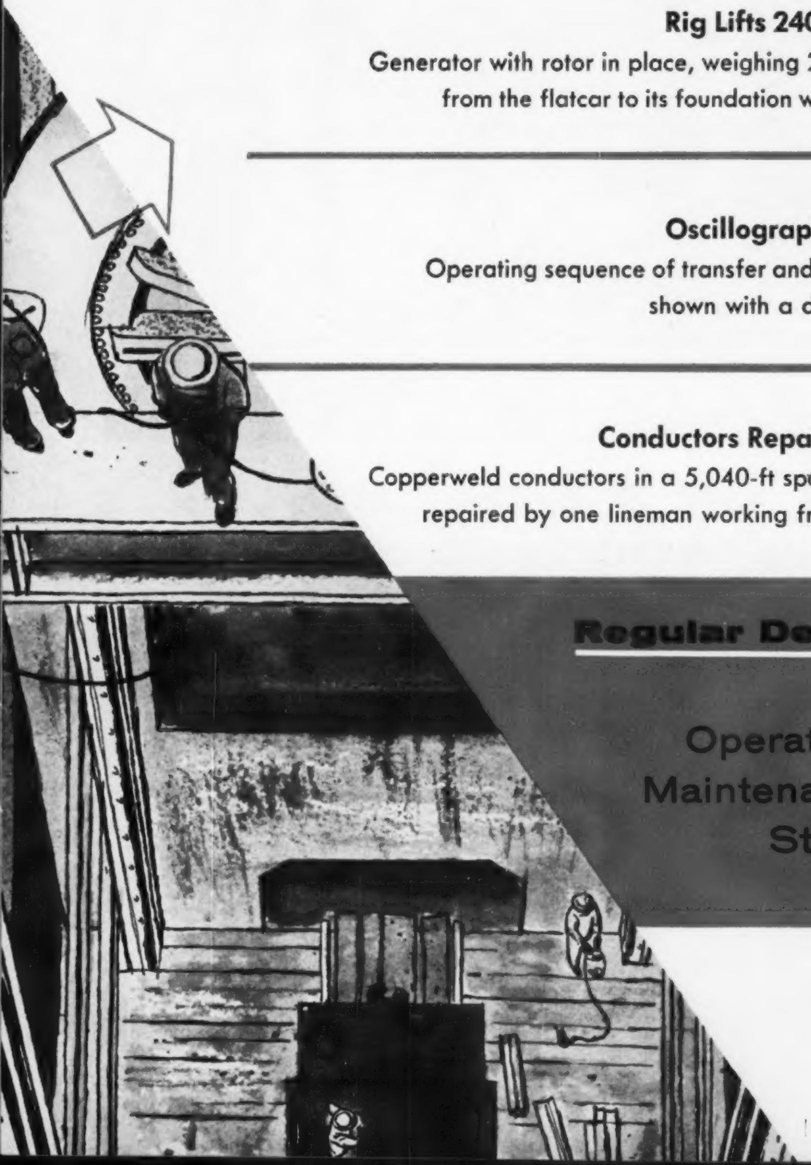
ROME CABLE
DIVISION OF **ALCOA**

Electrical World Report

MARCH
APRIL
1960

ELECTRIC utility methods

CONSTRUCTION • OPERATION • MAINTENANCE



Rig Lifts 240-Mw Generator 27 Ft
Generator with rotor in place, weighing 293 tons, was transferred from the flatcar to its foundation with a special hydraulic rig p 110

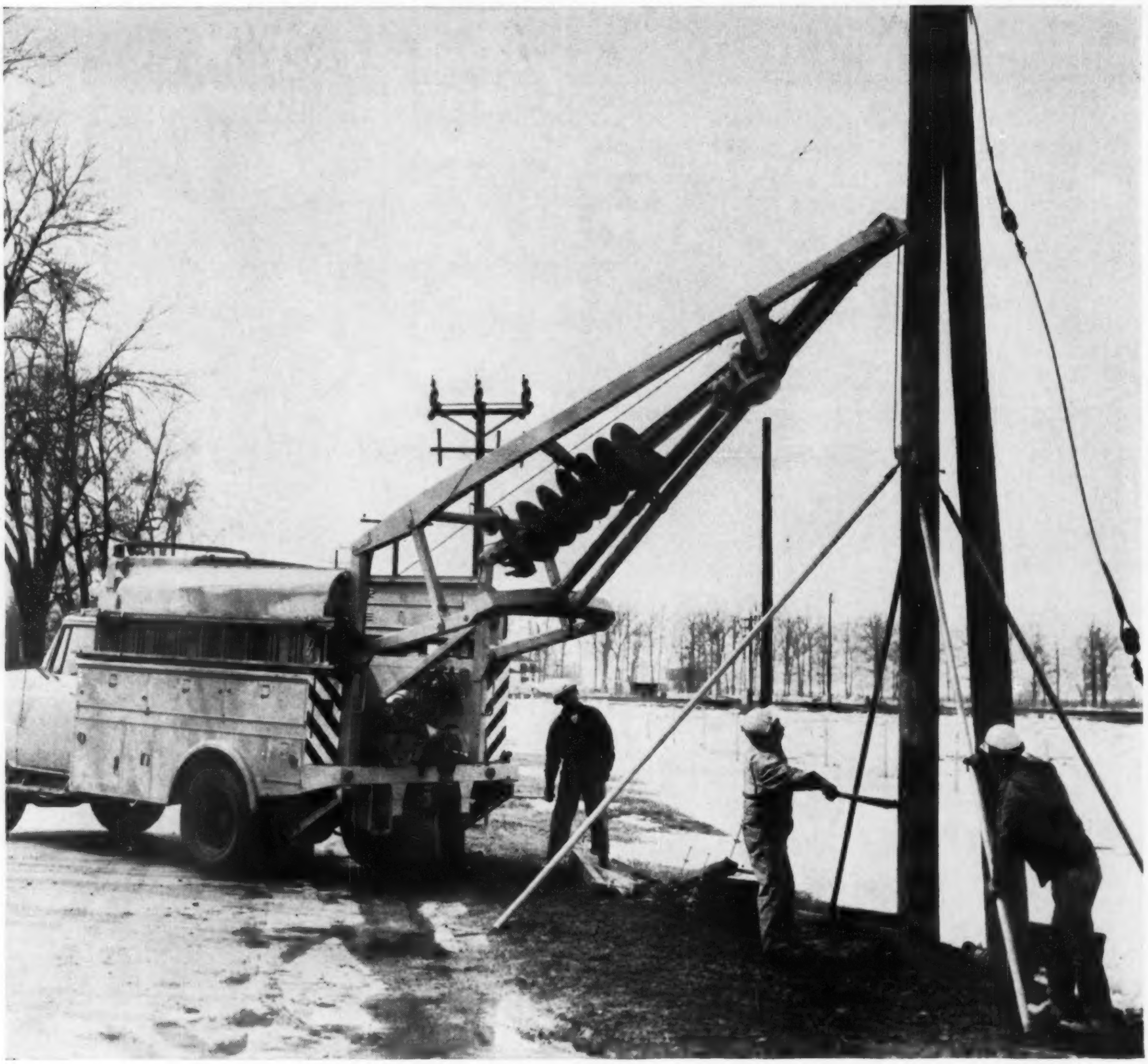
Oscillograph Checks LTC Circuits
Operating sequence of transfer and selector switches may be shown with a direct-writing oscillograph p 112

Conductors Repaired from 40-Ft Boom
Copperweld conductors in a 5,040-ft span on 405-ft towers were repaired by one lineman working from a special 40-ft boom p 114

Regular Departments

Construction p 116
Operation & Testing p 122
Maintenance & Repair p 130
Stores & Shops p 148
Safety p 152

New Equipment p 93
Manufacturers
Literature p 138



THREE MEN ON A WORKHORSE
save utility $900 in 10 days

Slashing $905.60 from a utility's construction and maintenance cost in a 10-day comparison period is no small accomplishment.

Yet it was easy. Holan's Three-Man Crew Unit went into the field and did the work of five men. Labor costs were drastically reduced—and two men were freed for other work assignments.

The three men used the spacious Holan CM-138 Line Construction Body equipped with a powerful, single-cylinder Model 25-C Derrick and 4401-H Earth Borer.

The five-man crew traveled in a line construction body with crew compartment. A two-legged derrick was used, but all digging was done manually.

The cost comparison was made on such jobs as setting, removing and loading poles, digging anchor holes, pulling butts and installing pole facilities.

Write today for more information on Holan's Three-Man Crew Unit—the body-derrick-digger combination that conserves manpower and saves you money.

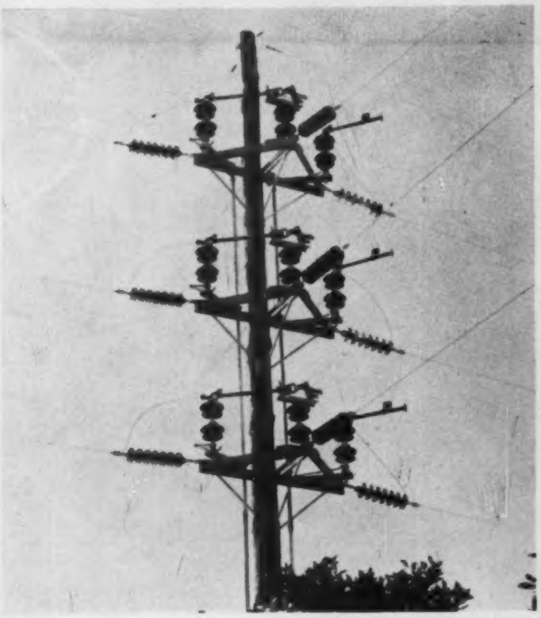
Holan Corporation, 4100 W. 150th St., Cleveland 35, Ohio
Plants in: Cleveland, Ohio; Griffin, Georgia; Phoenix, Ariz.

Holan

Subsidiary of THE OHIO BRASS COMPANY

HOLAN

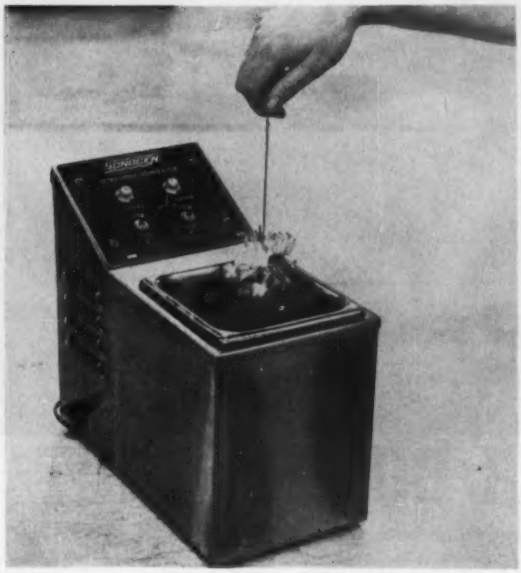
NEW EQUIPMENT



Tap-Off Switches . . .

. . . with aluminum frames are lightweight and are attached to poles with through-bolts. Designated Alto units, they are designed for sectionalizing, for switching feeders and sources, and for picking up and interrupting line charging and magnetizing inrush currents to 15 amp. Units are furnished for 1, 2 or 3-way switching. Ratings are from 34.5 to 69 kv, 600 and 1200 amp.

I-T-E Circuit Breaker Co, Greensburg Div, Greensburg, Pa. **(1)**



Ultrasonic Cleaner . . .

. . . for meters and precision parts is fully transistorized and only 14 in. long. The ½-gal stainless steel tank for holding the cleaning solution is removable. The operator needs only the two simple panel controls to use the model LGT-40. Input is 120 w at 115 v, 50/60 cps.

Branson Ultrasonic Corp, 40 Brown House Rd, Stamford, Conn. **(2)**

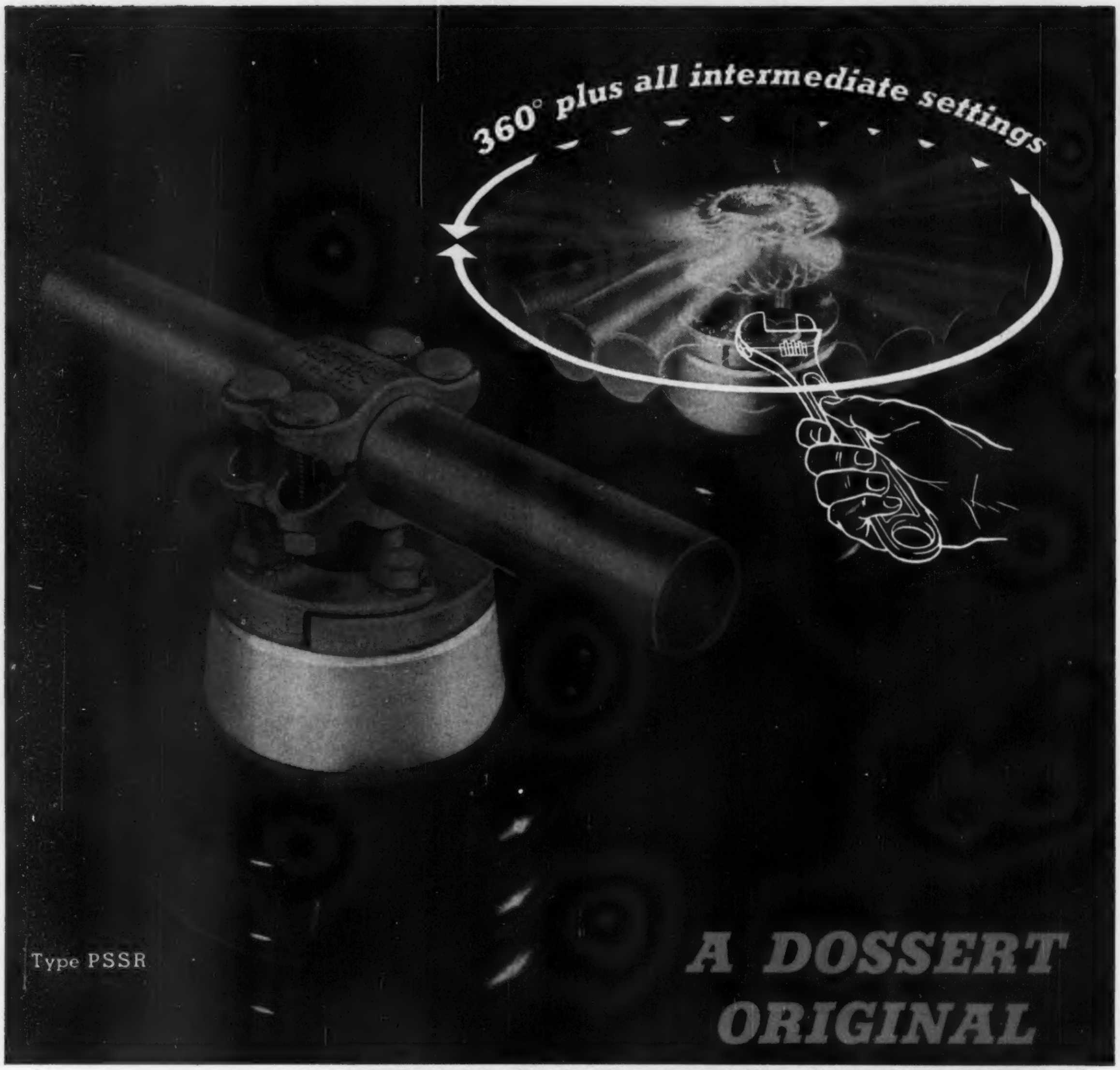
A
B
C
FAULT DETECTOR

Fault Detector . . .

. . . is completely transistorized and has no relay contacts. The 3-phase fault detector warns immediately of a fault from any phase to ground by flashing light and horn. Required mounting space is 11½ x 14½ in.

General Kinetics Corp, 3151 Kenwood Ave, Burbank, Calif. **(3)**

(More New Equipment on page 95)



fully adjustable, TUBULAR BUS SUPPORT*

This bus support, made of high-strength bronze throughout, has the following outstanding features:

- Fully adjustable to any angle whatsoever within a complete circle (360°).
- No need to lift bus out of support to change angular position.
- To change position within seconds, merely loosen 4 insulator mounting bolts, rotate assembly to desired angle and re-tighten bolts.
- No inaccessible internal bolt employed for angular setting.
- The only bus support whose angular adjustment does not jeopardize its overall strength.
- By reversing cap bus can be tight-mounted or slip-mounted.

Write for illustrated brochure!

*U. S. PAT. 2,861,762

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YEARS OF
TECHNICAL
KNOW HOW

DOSSERT MFG. CORP.
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Distributed outside the
U.S.A. and Canada by:
**INTERNATIONAL GENERAL
ELECTRIC COMPANY**
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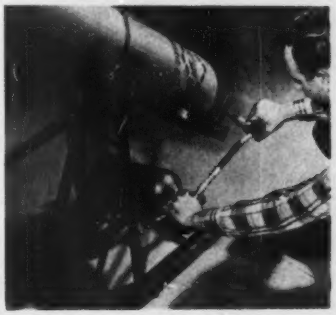
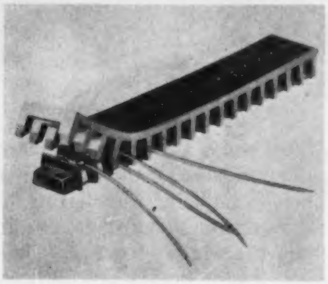
Wood Ladder . . .

. . . features rubber sling (shown) at the top for fit against poles. Surefoot Ladder is fitted with spring-loaded feet which are self-adjusting to any terrain to keep the rungs level. Abrasion-resistant plastic shielding for the rails is also available to minimize splintering from carrying racks.
Industrial Ladder Co, 1212 Powell St, Oakland, Calif. (4)

Refill Unit . . .

. . . enables recharging in the shop or on the job of Jet Line Cylinders, used for threading pulling lines through conduit by gas. This obviates returning bottles to the distributor for refilling, hence reduces the on-hand number of these bottles.
Jet Line Products, 615 Fugate Ave, Charlotte 5, N. C. (5)





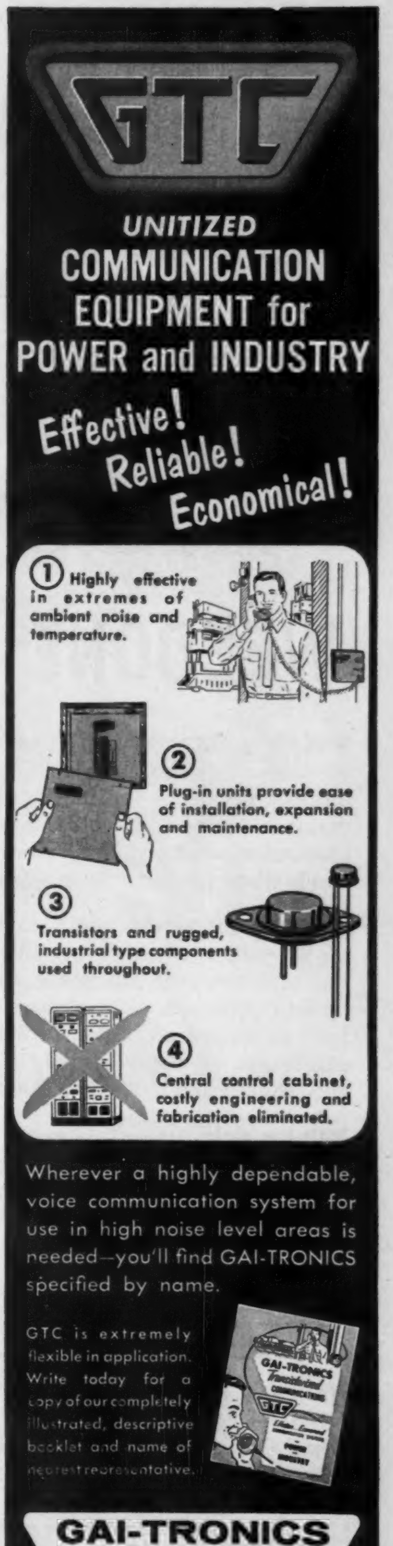
Rubber Cover . . .

. . . for terminal blocks reduces the danger of fire, short circuits and shocks to personnel. TA covers are available in neoprene, buna-N and silicate rubber. Three types are furnished. One fits over a single terminal pole.
TA Mfg Corp, 4607 Alger St, Los Angeles 39, Calif. (6)

Hard Hat Covers . . .

. . . have high visibility to further safety for crews working on highways. Ray-D-8 covers are of vinyl bonded to nylon and fit all makes and sizes of hard hats. The material has brilliance, high tear strength and resistance to fading. Ray-D-8 vests fit over the heaviest clothing.
Industrial Products Co, 2808 N 4th St, Philadelphia 33, Pa. (7)

(More New Equipment on page 96)



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Effective! Reliable! Economical!

① Highly effective in extremes of ambient noise and temperature.

② Plug-in units provide ease of installation, expansion and maintenance.

③ Transistors and rugged, industrial type components used throughout.

④ Central control cabinet, costly engineering and fabrication eliminated.

Wherever a highly dependable, voice communication system for use in high noise level areas is needed—you'll find GAI-TRONICS specified by name.

GTC is extremely flexible in application. Write today for a copy of our completely illustrated, descriptive booklet and name of nearest representative.

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CORPORATION
Dept. A
READING, PENNA.

A SUBSIDIARY OF GILBERT ASSOCIATES, INC. ENGINEERS AND CONSULTANTS

CIRCLE 95 ON READER SERVICE CARD

Whatever your brush problem

Line?

Roadside?

Right-of-way?

WEEDONE can solve it!

With the right background—Chemical control of weeds and brush has developed along established lines of procedures and practices. Amchem initially pioneered the major advances in the field, has originated many of today's accepted procedures and products for efficient, economical weed and brush control. Your problems are in *experienced* hands when you hand them to Amchem!

With the right approach—Amchem's corps of weed and brush specialists are basically application specialists. Combining comprehensive theoretical and practical experience they are able to offer all industry a realistic approach to *any* weed or brush problem. These specialists have developed a variety of efficient weed and brush eradication programs over thousands of miles of line, roadside and right-of-way areas once choked and inoperable due to infestation.

With the right product—Amchem's tremendously diversified product line is your assurance that the right weed and brush killer is available and will be utilized for your specific problem. Weedone Brush Killers, for example, have been used in the field for years and proven eminently successful in eliminating weeds and brush wherever they are a problem. Why not bring your problems to Amchem?

Amchem and Weedone are registered trademarks of Amchem Products, Inc.

AMCHEM PRODUCTS, INC.
AMBLER, PA.

Please send me copies of your "Brush Control" brochure and full information on the uses of Weedone Brush Killers.

Name__________ Title__________
Company__________
Address__________
City__________ Zone_____ State__________

AMCHEM

WEEDONE
BRUSH KILLERS

another chemical development of
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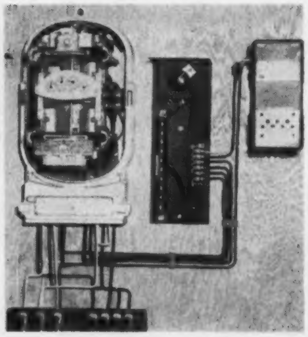


Excess Kwhr Meter

. . . at low cost can be adjusted to desired point of excess in the field. Parts and instructions are now available for field conversion of any standard 2, 3 or 4-element meter to excess kwhr meter. The unit is easier to test than former models.

General Electric Co, Schenectady 5, N. Y. **(8)**

Ground Anchor . . .

. . . has a 14-ton holding force. The 16-in. Universal ground anchor requires no digging, for arrowhead shape permits driving it manually to the 3-ft holding depth. Bodies are fabricated in aluminum alloy and malleable iron.

Laconia Malleable Iron Co, Laconia, N. H. **(9)**

Dielectric Tester . . .

. . . checks long cables, motors, transformers and other heavy electrical equipment. HYWATT HYPOTS have high output currents required for breakdown testing. Highest-rated unit of eight models has an output of 10,000 v ac at 1 kva, continuous

(*Continued on page* 98)

Field rings were breaking brushes!

OUR HERO
OUR PRESIDENTS
PURRRRRRRRR

NATIONAL stopped brush breakage!

TRADE-MARK

DOWN-TIME COULD HAVE COST THIS POWER COMPANY A FORTUNE!

"RED" BLACKBURN

PROBLEM: Threading and grooving of the steel field rings on giant turbine generators.

RECOMMENDATION: "National" brush grade 634.

RESULTS: This brush eliminated threading, grooving and resisted breakage and chipping when applied to eccentric rings.

Contact your "National" Brush Man

"National", "N" and Shield Device, and "Union Carbide" are registered trade-marks for products of

NATIONAL CARBON COMPANY

Division of Union Carbide Corporation . 270 Park Avenue, New York 17, New York

IN CANADA: Union Carbide Canada Limited, Toronto

UNION CARBIDE

INDUCTIVE PICK-UP
IN INSULATOR'S CLOTHING

This is a current-sensitive pick-up* whose looks may be deceiving: the "package" is a post-type insulator, but buried in it is an inductive pick-up coil. For every 60 amps flowing in the conductor, one volt is induced in the coil—and the relationship is *linear*, within a few percent, up to 5000 amperes. Furthermore, the voltage bears a fixed phase relationship to the conductor current.

We could offer this as a "standard product" (in fact, you can order one or a hundred right now, if you like), but it seems better to tell you how it works and then hope you'll tell *us* what you want to do with it. You can use it to feed a vacuum tube or transistor controlling circuit, one or more relays, a magnetic amplifier, panel instrument and other "black boxes". Here a few possibilities — some of them ideas, others actual applications: capacitor switching on the basis of phase angle or current; load limit tripping, checking or warning; built-in means of measuring line current; power direction sensing. No matter how you use it, this pick-up offers several possible advantages to you: low first cost and installation economies, safety, convenience, elimination of hot sticks and dead-ending . . . .

Some of these devices have been installed in the field along with the appropriate black boxes. We even have a few of these boxes all made up, and can build more. If you have an idea about how you'd like to use this pick-up, we'd certainly like to hear from you. The Fisher-Pierce Co., 82 Pearl St., So. Braintree 85, Mass.

*Pat. Pending

FP
FISHER PIERCE
PHOTOELECTRIC LIGHTING CONTROLS
AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

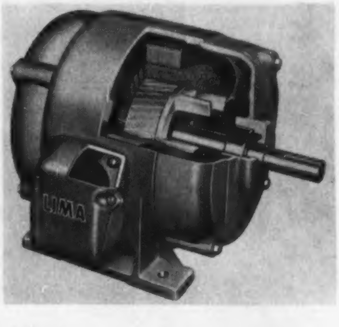
Dielectric Tester . . .

(*Continued from page 96*)

rating. Intermittent ratings are about double the continuous ratings. Output voltage is continuously adjustable from zero to maximum.
Associated Research, Inc, 3777 W Belmont Ave, Chicago 18, Ill. **(10)**

Portable Lantern . . .

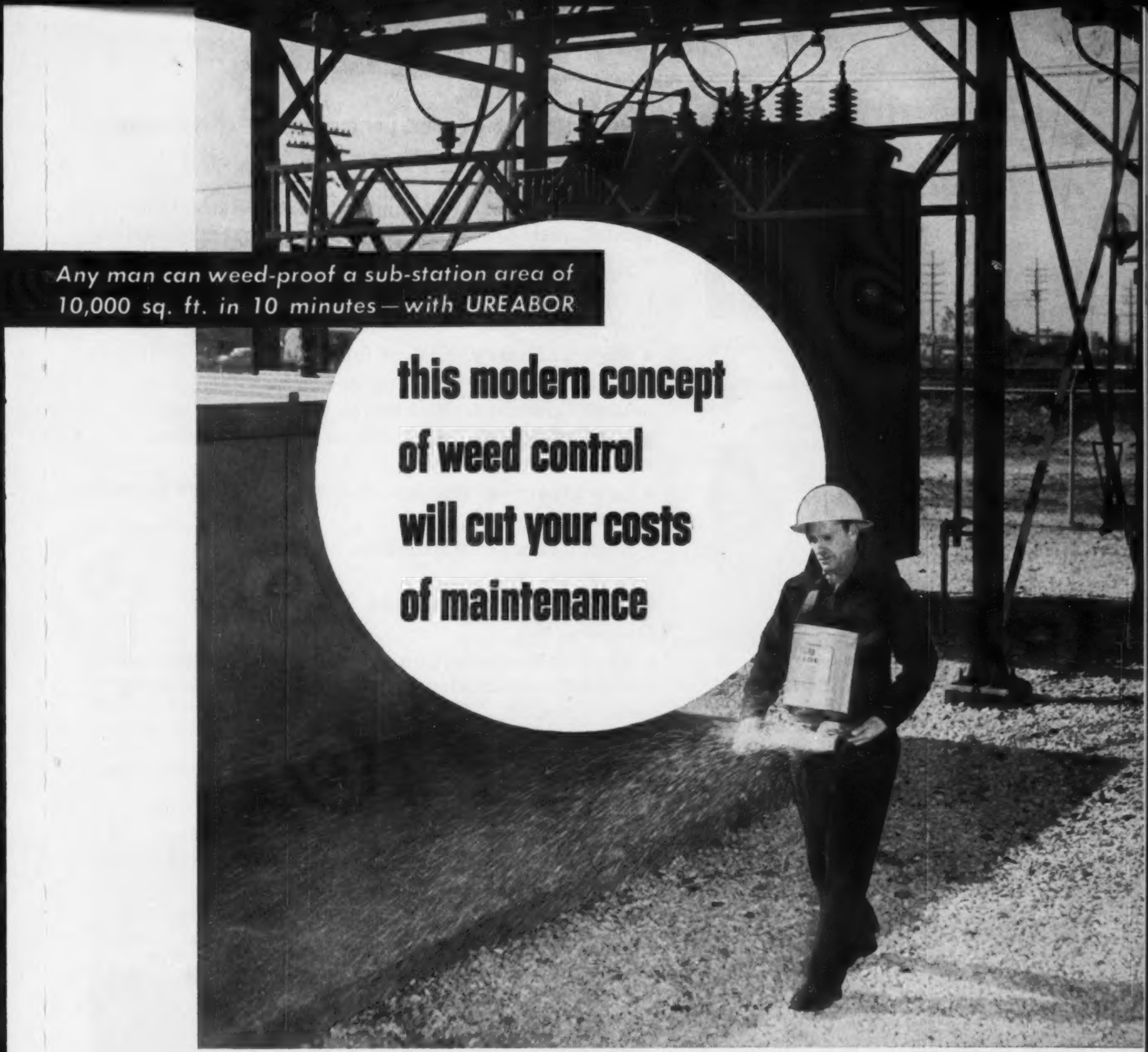
. . . **of 80,000 candlepower** provides nearly a mile of visibility. Radar-Lite lantern operates from a 12-volt battery. The lamp can be tilted up or down 135 deg.
Burgess Battery Co, Freeport, Ill. **(11)**



Motors . . .

. . . **for general use** rated from 1 to 150 hp meet new NEMA specifications. Dripproof enclosures protect against dirt and dripping liquids. Type RS motors are available for 3 and 2-phase systems to 600 v.
Lima Electric Motor Co, Inc, Lima, Ohio. **(12)**

(More New Equipment on p 101)


Any man can weed-proof a sub-station area of
10,000 sq. ft. in 10 minutes—with UREABOR
this modern concept
of weed control
will cut your costs
of maintenance

–just apply **UREABOR**® *and you can forget about weeds for the season!*

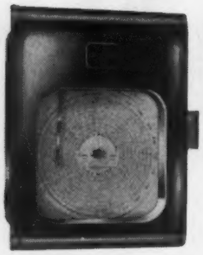
Now you can chalk up big savings in weed control! Ureabor weed and grass killer makes this possible. Your own men can apply this dry granular material safely anytime during their regular rounds. One treatment does the job for the year; takes only a few minutes of their time. Ureabor weed killer is always ready to use direct from the convenient 50-lb. sack. There's nothing to mix . . . no water to haul . . . no need for costly spray equipment. And, because Ureabor is applied DRY, there is no spray-drift hazard to adjacent vegetation. Application rates are low. Only 1 to 2 lbs. per 100 sq. ft. The handy PCB Spreader does the job quickly and easily. *(See photo)* So, do as scores of other industries are doing . . . start saving time and money on *your* weed problems with Ureabor. It has been proved safe and effective during the past six years! Write today for literature.

UNITED STATES BORAX & CHEMICAL CORPORATION
630 SHATTO PLACE • LOS ANGELES 5, CALIFORNIA

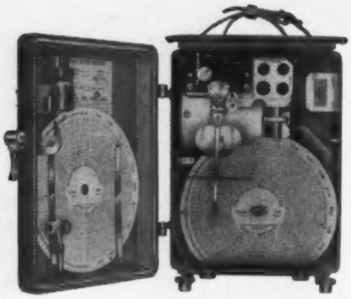
CIRCLE 99 ON READER SERVICE CARD

Bristol's rugged, moving-iron element:

Key to RECORDING VOLTMETER ACCURACY and RELIABILITY



Bristol Recording Voltmeter for permanent mounting.



Bristol Recording Voltmeter for portable use. Compact Series 631.

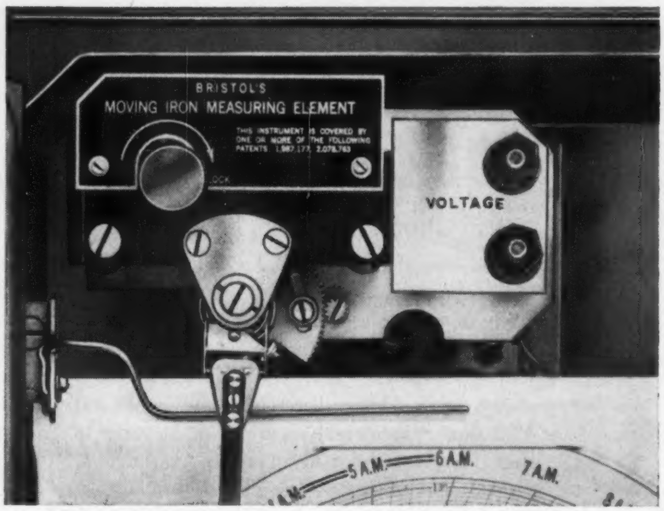
Up to 3 elements, 3 pens, per instrument for recording up to 3 independent voltages on a single chart

Nobody can make a recording voltmeter movement like Bristol... field-proved for year-in and year-out dependability and precision. Check these outstanding features:

- **Thermistor compensated.** Results in negligible temperature error.
- **High Accuracy.** ±1% of full scale.
- **High-Torque.** The Bristol moving iron mechanism produces greatest feasible torque, keeps weight and power drain to a minimum, assures positive recording over full range.
- **Low Electrical Burden.** Only 5.5 VA at 120V for each mechanism.
- **High Calibration Stability.** Seldom requires calibration.
- **Easy Calibration in Field.** No special tools or skills required.
- **Rugged Construction.** Shockproof ball-bearing movements; pen locking device for shipping or carrying portable models.
- **Leveling Not Critical.**
- **ASA Models Available.** Meet Specification C39.2-1953.

These are just a few of the good reasons it will pay you to standardize on Bristol 1, 2, or 3 pen recording voltmeters. For more facts on Bristol recording voltmeters and ammeters, write for Bulletin E1111.
The Bristol Company, 116 Bristol Road, Waterbury 20, Conn.

O.3

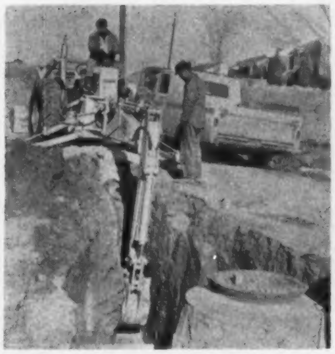


BRISTOL ... for improved production through measurement and control

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Panelboard . . .

. . . **provides flexibility** for commercial, light industrial and apartment distribution. The NALP circuit breaker panelboard has main buses to 600 a. It takes the full line of Stab-Lok molded case breakers, 15 to 100 amp, 1, 2 and 3-pole.
Federal Pacific Electric Co, 50 Paris St, Newark 1, N. J. (13)



Wheel Tractor . . .

. . . **has high contact-area rear tires.** Power steering and synchronized shuttle transmission with eight speeds in each direction provide easy maneuvering and rapid loading for the Utility Line unit. Capacity of the Model 530 is 2,000 lb. Its backhoe digs 14 ft deep and 16 ft 9 in. from pivot. The Model 430 with 1,000-lb capacity is also available.
J. I. Case Co, Racine, Wis. (14)

(More New Equipment on p 102)

Now line crews can apply ground-line pole preservative

CHAPMAN®

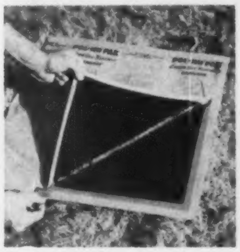
POL-NU PAK

Convenient, envelope-type ground-line treatment bandage for quick application wherever needed

Enlist your line crews in a system-wide effort to get longest service life from standing poles. With Chapman Pol-Nu Paks carried as standard equipment on service trucks, crews can apply ground-line preservative treatments to poles.

This convenient pole preservative bandage comes as a factory-sealed envelope containing Chapman Pol-Nu, the original grease-type pentachlorophenol preservative. Applied as shown in the steps below, it prevents errors and assures adequate Pol-Nu at the ground-line to restore natural loss of preservative in this critical area, resulting in many years of additional pole life.

Pol-Nu Paks are available in several sizes and, because of their convenience, are sometimes preferred for all ground-line treatment work. However, Chapman Pol-Nu in bulk containers and the Pol-Nu Bandage-Maker for preparing pole bandages in the field offer economies where many poles are to be treated. For information on both methods, using your own crews or contractor-applicators, mail the coupon below.



Slit Pol-Nu Pak on three sides to expose preservative.

Wrap bandage around pole at ground-line and staple.

Back-filling completes job, assuring longer pole life.

CHAPMAN CHEMICAL COMPANY
Leading manufacturer of wood preservatives • Memphis 1, Tenn.
Palo Alto, Cal. • Portland, Ore. • Minneapolis • Charlotte, N. C.

CHAPMAN®
POL-NU PAK

MAIL COUPON FOR COMPLETE DATA
Chapman Chemical Company
P. O. Box 138, Memphis 1, Tenn.
Please send data on Pol-Nu Pak and information on extending pole life to:

*Name*____________________
*Company*____________________
*Address*____________________
____

HOW GOOD IS...
AN IMITATION Amp-trap® ?

LOOKS LIKE
WORKS LIKE
JUST AS GOOD
COSTS SAME
SHAWMUT
Amp-trap
AS GOOD
BIGGER
BETTER
COSTS LESS
for
600 Volts
or less

Amp-trap®
VS IMITATIONS

Amp-traps are *our* products. We originated and developed them. We alone manufacture them. They are so good that others are now imitating them. This is flattering because it indicates Amp-trap is superior. But, don't be confused by imitations.

Amp-trap®
VS SUBSTITUTES

"Just like Amp-trap." "As good as Amp-trap." "Works like Amp-trap." "Better than Amp-trap." These are the deceptive phrases that imitators must use. Without them they can neither explain nor sell their substitutes.

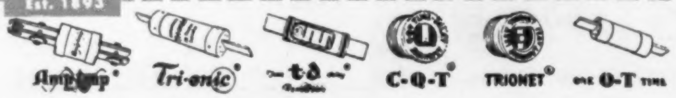
NOTHING TAKES THE PLACE OF
Amp-trap®

Whenever you *need* Amp-trap, you *want* Amp-trap — not an imitation or a substitute. Amp-trap is a very special current limiting device with high interrupting capacity. Regardless of claims, imitations aren't enough. More than 27 patents prove it. *Nothing takes the place of Amp-trap!* For your own protection specify Amp-trap. Then — make sure you get it.

Amp-trap® – *Awake At The Switch*

REGISTERED UNITED STATES PATENT OFFICE
Est. 1893

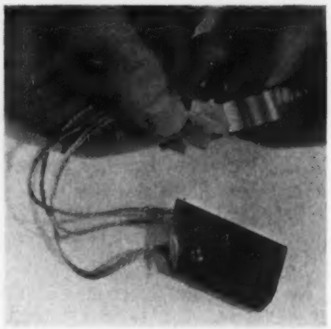
THE **CHASE-SHAWMUT** CO.
374 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS
Subsidiary of I-T-E CIRCUIT BREAKER CO.,



CIRCLE 102 ON READER SERVICE CARD

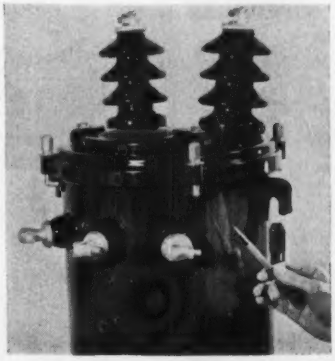
Hydraulic Ladder . . .

. . . is redesigned with plate metal support frame instead of tubular for added rigidity. Non-skid pierced metal pedestal step treads and relocation of the rotation crank improve ease of operation and safety. Lengths of 28 and 32 ft are available. Rotation is 360 deg and elevation 75 deg. **Holan Corp, 4100 W 150th St, Cleveland 35, Ohio.** **(15)**



Schering Bridge . . .

. . . measures dielectric loss factor tan δ and the capacitance of ungrounded or grounded test objects at high and low voltages. It also determines dielectric constants of solid and liquid insulating materials. No-loss capacitors and other auxiliary devices for measurements are also available. **EPIC Inc, 150 Nassau St, New York 38, N. Y.** **(17)**



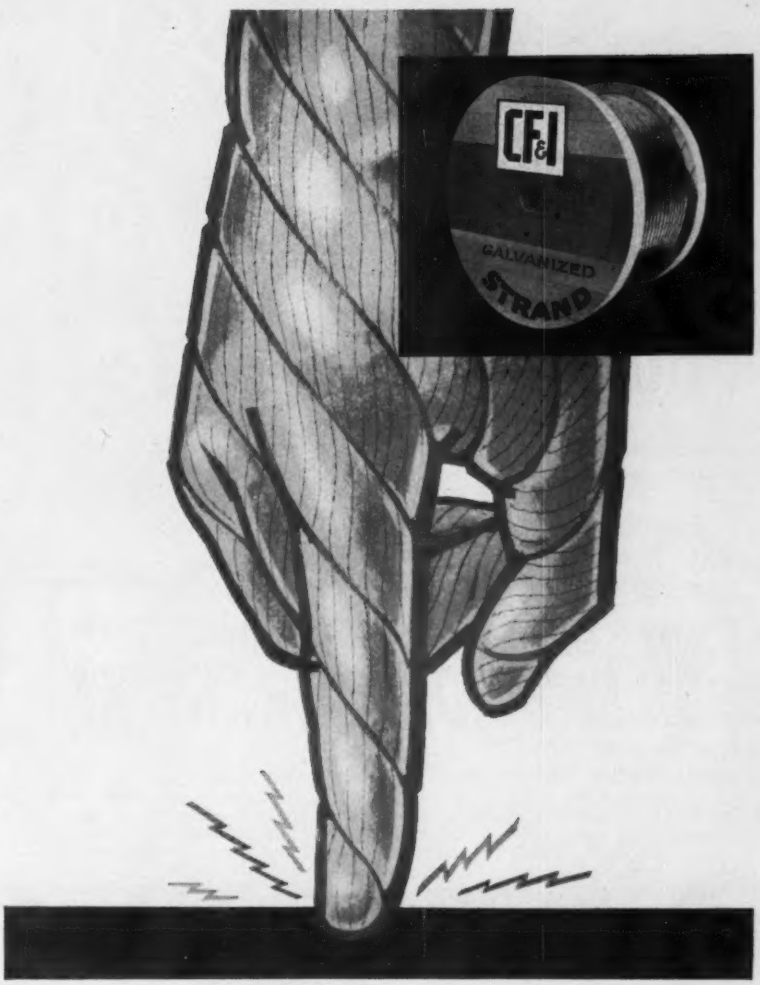
Terminal Assembly...

. . . **for brushes** facilitates replacement on motors and generators in which the brushes are difficult to reach. The quick-disconnect assembly is bolted to the machine. One or two terminals can be snapped into it.
National Carbon Co, Div of Union Carbide Corp, 30 E 42nd St, New York 17, N. Y. **(16)**

Protective Coating...

. . . for distribution transformers guards against corrosion. Tuffilm is a finely divided synthetic acetate resin powder fused to the tank surface at high temperature. It has a high gloss finish and high impact strength.
Allis-Chalmers Mfg Co, Milwaukee 1, Wis. **(18)**

(More New Equipment on p 104)



Ground
the destructive force
of lightning with

CF&I Galvanized Steel Strand

For grounding of power transmission lines, CF&I Galvanized Steel Strand has been proved by years of experience. Weldless Overhead Ground Wire Strand is made of special analysis steel to ASTM specification A-363, in three- and seven-wire constructions. It is carefully galvanized for extra weather resistance.

For guy, messenger and other applications, CF&I Strand is made to ASTM specification A-122. CF&I can also manufacture strand to your individual specifications. For prompt delivery, see your local electrical distributor or contact the nearest CF&I office.

7635-A

CF&I STEEL

GALVANIZED STEEL STRAND
THE COLORADO FUEL AND IRON CORPORATION

In the West: **THE COLORADO FUEL AND IRON CORPORATION** — Albuquerque • Amarillo Billings • Boise • Butte • Denver • El Paso • Farmington (N. M.) • Ft. Worth • Houston Kansas City • Lincoln • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland Pueblo • Salt Lake City • San Francisco • San Leandro • Seattle • Spokane • Wichita
In the East: **WICKWIRE SPENCER STEEL DIVISION** — Atlanta • Boston • Buffalo • Chicago Detroit • New Orleans • New York • Philadelphia • **CF&I OFFICE IN CANADA:** Montreal
CANADIAN REPRESENTATIVES AT: Calgary • Edmonton • Vancouver • Winnipeg

CIRCLE 103 ON READER SERVICE CARD

SILENT HOIST & CRANE CO. B'KLYN, N.Y.
KRANE KAR

SILENT HOIST
KRANE KAR
360° SWING

2 SIZES:
MODEL FAX—12,000 lbs. cap.
MODEL FAY—20,000 lbs. cap.

THE LOW COST OF LIFTING WITH...
SILENT HOIST KRANE KAR

360° BOOM SWING—*Now . . . another addition to the famous family of Silent Hoist* **KRANE KAR** *. . . the original Mobile Swing Boom Crane!* **BOOM ROTATION:** *All-Hydraulic 360° continual rotation on heavy-duty double-race ball-bearing turntable.* **BOOM:** *15/22 ft., manual or hydraulic telescoping.* **TRANSMISSION:** *Hydraulic power shift directional in combination with flywheel torque converter.* **STEERING:** *Full time power steering, finger-tip control.* **ENGINE:** *Heavy duty 6 cylinder valve-in head type.* **BOOM TOPPING:** *Horizontal to highest vertical in only 8 seconds.* **BOOM HOISTING:** *Load block 3 parts of line 25 to 55 fpm.* **TIRES:** *Dual pneumatic tires on traction axle for high flotation and extra blow-out protection.* **TOTAL VISION AND SAFETY:** *No obstruction in any position of load or crane; operator fully protected through 360° rotation of boom. Write for complete details in illustrated bulletin #99.*

180° BOOM SWING—*The Standard widely favored All-Hydraulic or Mechanical 180° swing boom crane models. Lifts, carries, and places any load up to 12½ tons. One engine powers the machine for travel and all crane applications—finger-tip control. Front traction wheel drive supports chassis and crane load. 2 geared speeds for hoisting, topping, and swinging. No tail swing—Boom never passes over Operator's head. Write for complete details in illustrated bulletin #79.*

SILENT HOIST
KRANE KAR
180° SWING

5 SIZES:
1½, 2½, 5, 10, 12½ tons

SILENT HOIST & CRANE CO. · BROOKLYN 20, N.Y.

Portable Recorder . . .

. . . registers watts and vars on one strip chart. An inkless mechanism taps watts for 50 sec and vars alongside for 10 sec. The recorder contains phase-shift and time-switching devices within the same housing. Although a single-phase instrument, a single CF-8 can also be used for balanced polyphase circuits.

General Electric Co, Schenectady 5, N. Y. (19)

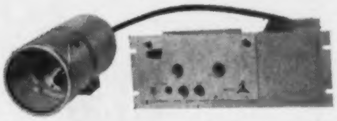
Wheeled Ladder . . .

. . . features stability and safety. Collapsible outriggers, shown set, a leveling jack and an anchoring device provide stability. Safety is further promoted by guard rails on the sides and pulpit-type guard rail at the top. "Bally-Hi" ladder length is 28 ft. Overall collapsed height of 77 in. permits rolling through ordinary doorways.

Ballymore Co, West Chester, Pa. (20)

TV Camera System . . .

. . . **withstands vibration, weather,** shock, dust and extremes of environment without an auxiliary housing. The model RGS-10 Ruggedized Television System consists of camera and camera control, which operate up



to 2,000 ft apart. The camera weighs 15 lb and is 16 in. long. The system is completely transistorized and employs modular construction with plug-in printed circuit components.
Dage Television Div, Thompson Ramo Wooldridge Inc, Michigan City, Ind. (21)

Rough-Terrain Truck...

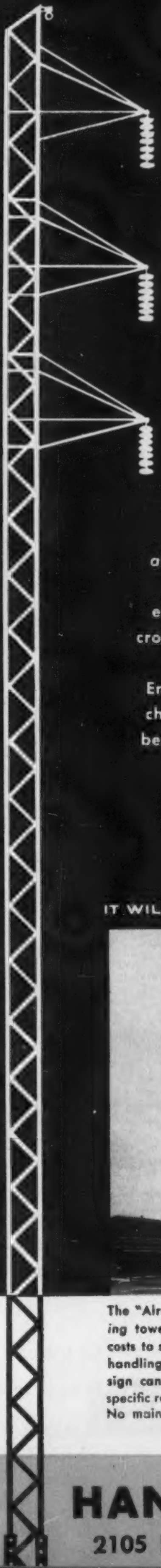
. . . **climbs a 3-ft high wall** or a 45-deg slope, swims rivers, drives through mud or snow, and does 56 mph on the highway. Articulated construction—the rear body is not a trailer—allows the center to arch or sway. Two models of Swiss-designed "Flex-Trac" carry one and two tons.
Clark Equipment Co, Industrial Truck Div, Battle Creek, Mich. (22)

Conversion Unit . . .

. . . **for flasher warning lights** provides for conversion of older units to meet state highway requirements demanding 30%

(*Continued on page* 106)

CIRCLE 105 ON READER SERVICE CARD→



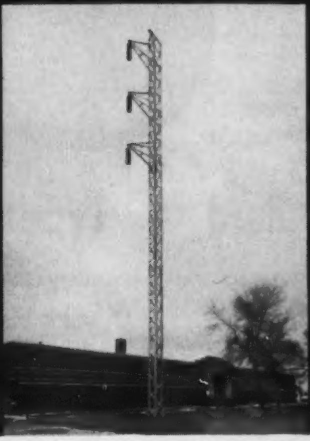
new

HANDLEY-BROWN

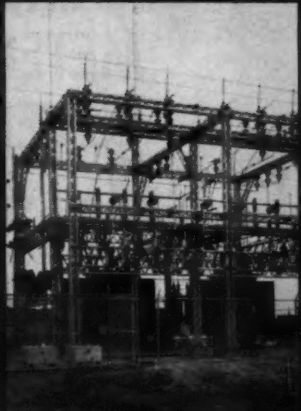
Alrectic® Aluminum Transmission Tower Cuts Standard Tower Weight by *80%!

85 feet high, 2 feet square, the Handley-Brown *aluminum* lattuce tower below is designed for use on a transmission line by one of the South's largest electric utility companies. Complete with 3 seven foot crossarms, **the pole weighs only 1,400 lbs., about 20% of the weight of an equivalent steel tower.* Employing specially designed extruded shapes for the chord angles, the tower is exceptionally strong. In tests before 40 utility engineers, it was subjected to stresses equivalent to a 140 mph wind without structural failure; exceeded NEMA standards by 12%! The Alrectic® tower is easy to handle, easy to erect. It eliminates the corrosion problem and no maintenance is required.

IT WILL PAY YOU TO GET ALL THE FACTS. WRITE TODAY.



The "Alrectic", truss-type, *free standing* tower is competitive in erected costs to steel. Its light weight reduces handling and erection costs. The design can be modified to meet your specific requirements. Won't corrode. No maintenance required.



Non-corrosive "Alrectic" aluminum substation structures keep their good looks with virtually no maintenance. Modular design reduces engineering and assembly costs, erection is quick and easy. Erected cost is competitive to steel.

HANDLEY-BROWN CO.
2105 Brooklyn Road, Jackson, Michigan

'Life Guard' Hats & Caps

The best in head protection for electrical/construction workers

Jackson's 'Life Guard' safety hats and caps safely resist over 20,000 volts, and they also provide impact resistance to more than satisfy federal requirements for safeguarding construction workers.

Standardize on this all-purpose safety hat for maximum head protection. Identify work categories by issuing these different hat colors: white, yellow, grey, and orange.

'Life Guard' safety caps have narrow brim around sides and back, visor in front. Injection molded plastic is strong yet flexible, has a soft comfortable feel. Caps may be ordered with attached welding helmets, goggles, and assorted face shields.

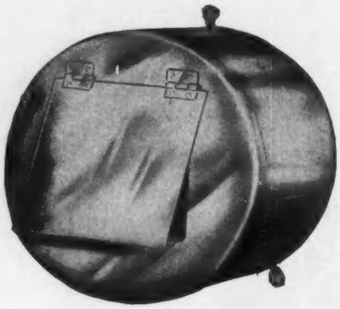
'Life Guard' safety hats offer neck protection with wide brim all around. The 'Life Guard' headgear is instantly adjustable in hat sizes, and its comfort keeps the hat where it does its job, on the worker's head. Chin straps and warm winterizers are available.

Sold by better welding supply and safety product dealers everywhere

Jackson Products
AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO., INC.
31739 Mound Road, Warren, Michigan

CIRCLE 161 ON READER SERVICE CARD

KEES SOCKET METER COVER



Fits All Standard "S" Type Meters

Made from 16 gauge zinc-coated, rust resistant steel and finished in gray baked-on enamel, the KEES Socket Meter Cover is designed to prevent breakage of glass on socket meters to insure long service in any climate. Outside diam.—8" and depth—5⅝" and over. Metal cover is also reported to minimize damage from excessive current surge due to electrical storms.

Write P. O. Box 764 for Free Electrical Catalogue.

F. D. KEES MFG. CO.
BEATRICE NEBRASKA

Since 1874

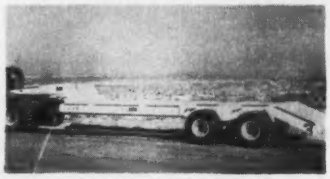
Conversion Unit . . .

(*Continued from page* 105)

dwell time. The WC-5-30 is a transistorized, incandescent flasher circuit encapsulated in a cylindrical plastic container.
Pacific Mercury Co, 13232 Leadwell, N Hollywood, Calif. (23)

Flame Photometer . . .

. . . measures chloride ion content of feed water continuously. Five point manifold system enables automatic sequential feed to the burner for spectral analysis. Process Flame Photometer has sensitivity of 0.1 to 10 parts per billion, and is adaptable to monitoring many other substances. It was developed for Indian Point nuclear power station.
Waters Associates, 45 Franklin St, Framingham, Mass. (24)

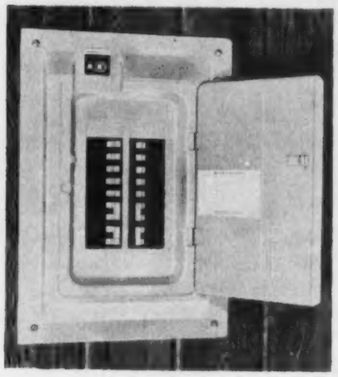


Trailer . . .

. . . carries 25 tons. The model TL-250 low-boy trailer's rear-end ramp facilitates loading. It has 20,000-lb axles and air brakes. Length from king pin to end of the ramp is 30 ft 10 in., platform length 13 ft, width 8 ft.
Leland Equipment Co, Tulsa, Okla. (25)

Breaker Panel . . .

. . . requires no extra parts or adapters for adding breakers. Time delay prevents unwanted trips from mild overloads. New color design makes a pleasing appearance in home installations. Sizes are from 2 to 42 circuits, capacities to 200 amp. Single-phase, 3-wire and 3-phase, 4-wire units with series, parallel and split-bus arrangements are furnished.



Cutler-Hammer, 315 N 12th St, Milwaukee, Wis. (26)

Motor Protection . . .

. . . against overload is provided by two miniature heat-sensing switches buried in the stator windings. Thermo-Tector, available on 3-phase induction motors to 125 hp, shuts off the motor when the winding temperature exceeds a set value or when temperature rise is rapid.

General Electric Co, Schenectady 5, N. Y. (27)

4400 RIFC SERIES

(RUST INHIBITIVE FINISH COAT)

ANODIC SELF PRIMING METAL KOLORS

4400 is a new dimension in paint protection. A single brush application yields a film 6-8 mils thick when dry. This is equivalent to 2 or 3 coats in protection for the labor cost of one painting.

ADHESION, FILM THICKNESS, RUST INHIBITION, DENSITY

A POLAR BEAR

stands extreme cold, is immune to water, does not rust,--and if provoked kills Eskimos

AND NOW WE HAVE ADDED

A POLAR BARRIER FOR METAL PROTECTION

A molecular link at the metal surface that increases adhesion and polarizes to form a barrier against corrosion.

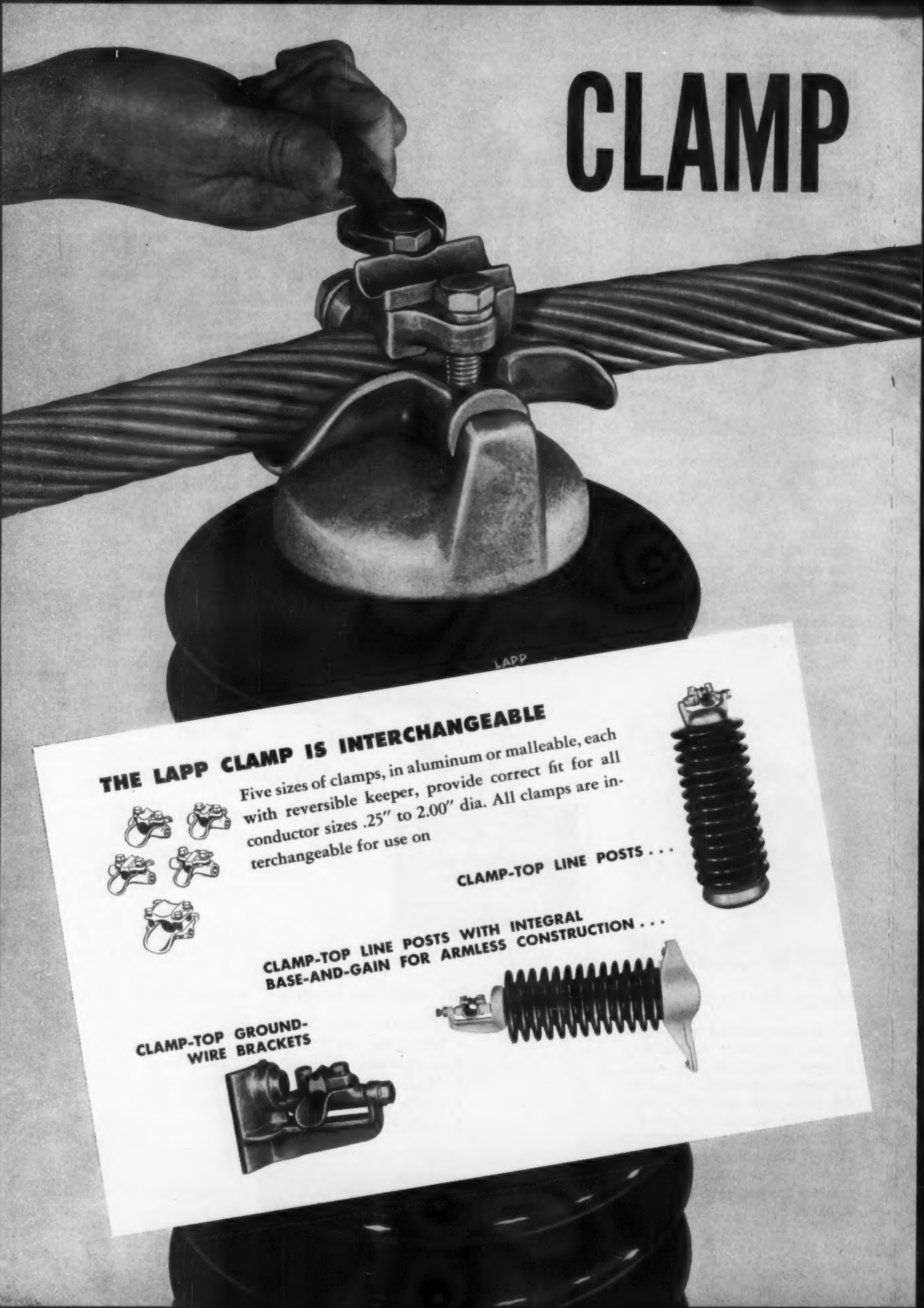
WRITE TODAY—PROTECT TOMORROW

For technical literature describing

- Transmission Tower Paints!
- Sub Station Structure Paints!
- Electrical Equipment Paints!
- High Temperature Paints!
- Shop & Steel Priming Paints!
- Chain Link Fence Paints!

KEELER & LONG, INC. K&L KOLORS **WATERBURY, CONN.**

CLAMP



THE LAPP CLAMP IS INTERCHANGEABLE

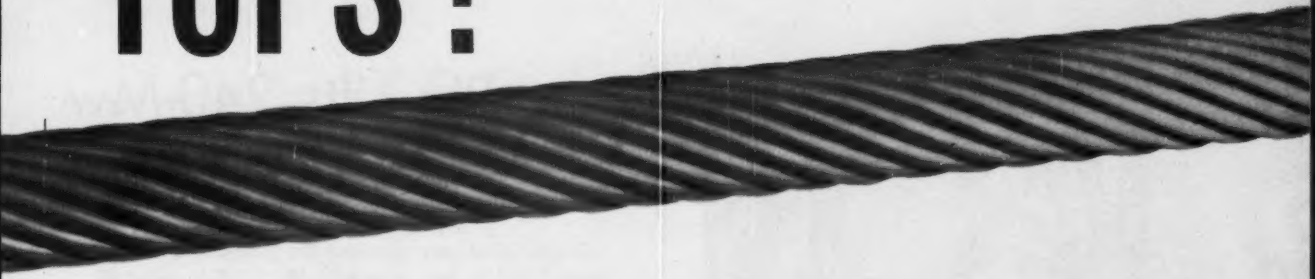
Five sizes of clamps, in aluminum or malleable, each with reversible keeper, provide correct fit for all conductor sizes .25″ to 2.00″ dia. All clamps are interchangeable for use on

CLAMP-TOP LINE POSTS . . .

CLAMP-TOP LINE POSTS WITH INTEGRAL BASE-AND-GAIN FOR ARMLESS CONSTRUCTION . . .

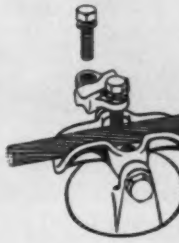
CLAMP-TOP GROUND-WIRE BRACKETS

-TOPS?



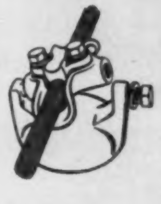
THE LAPP CLAMP IS EASIEST TO INSTALL

For original installation, insulator (or bracket) with clamp attached, is mounted to crossarm or pole. Keeper cap screws are loosened, and one removed. With keeper rotated out of position on remaining cap screw, conductor is dropped into place. Keeper is brought back to position, cap screw replaced, and both cap screws tightened. Cap screws have captive lock-washers so there is *only one loose part* per insulator throughout installation.



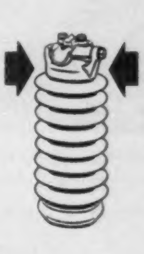
THE LAPP CLAMP IS EASIEST TO WORK WITH HOT-LINE TOOLS

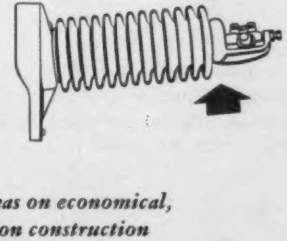
No special tools required for insulator change-out. A trunnion cap screw is merely backed off, and conductor (with clamp attached) lifted out of position. The same clamp will slip into position in a replaced insulator and be secured by tightening trunnion cap screw. *No loose parts* throughout insulator change.



THE LAPP CLAMP-TOP IS MOST DEPENDABLE

A principle of Lapp Post design is the *external* attachment of hardware—*bases and caps.* This assures that the porcelain body be loaded only in large-area low-intensity compression. This design takes full advantage of porcelain's superior compression strength, and provides an assembly greatly more secure than one subject to the high-intensity tension loading introduced by internal pins and inserts.





Lapp
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8

Lapp

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CIRCLE 109 ON READER SERVICE CARD

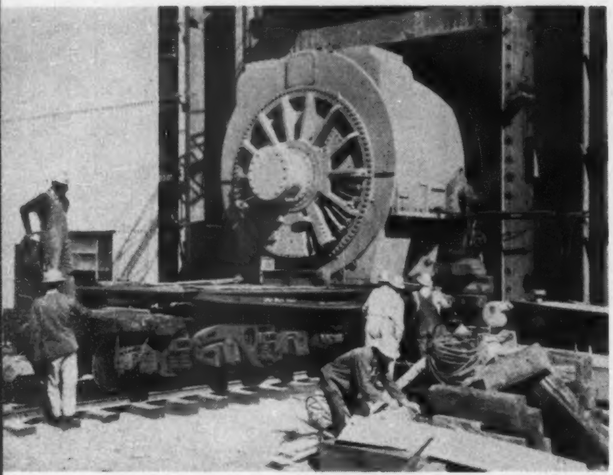
Rig Lifts 240-Mw

***LEE LASH**, Construction Supt, Oklahoma Gas & Electric Co, Oklahoma City, Okla.*

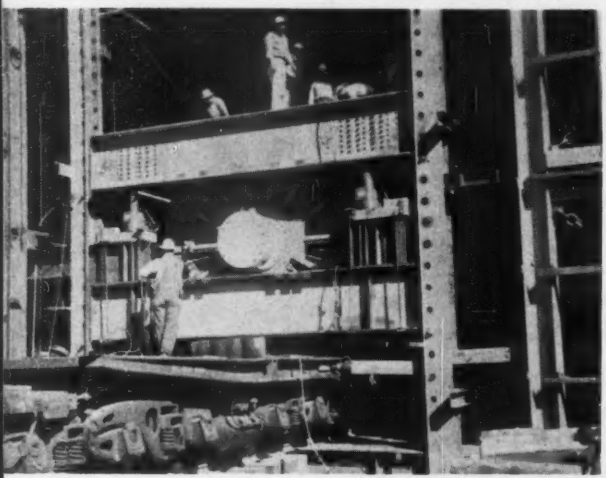
A special lifting rig solved the problem of installing a 240-Mw generator with the rotor in place at the Mustang Station of Oklahoma Gas & Electric Co. The stator and rotor, weighing over 293 tons, were shipped and installed together to save considerable time and several thousand dollars for the company. This unit, the largest installed to date on the OG&E system, had to be raised about 27 ft from the flatcar to its foundation in the station. There was no crane available to handle the weight of the complete generator.

For this lifting job, the special rig was rented. It consists of four vertical steel I-beams with holes drilled on 12-in. centers, eight horizontal I-beams and four hydraulic jacks. The vertical beams were set up and braced over the railroad tracks at the entrance to the station. They were positioned to enclose the generator when it came in on the railroad car.

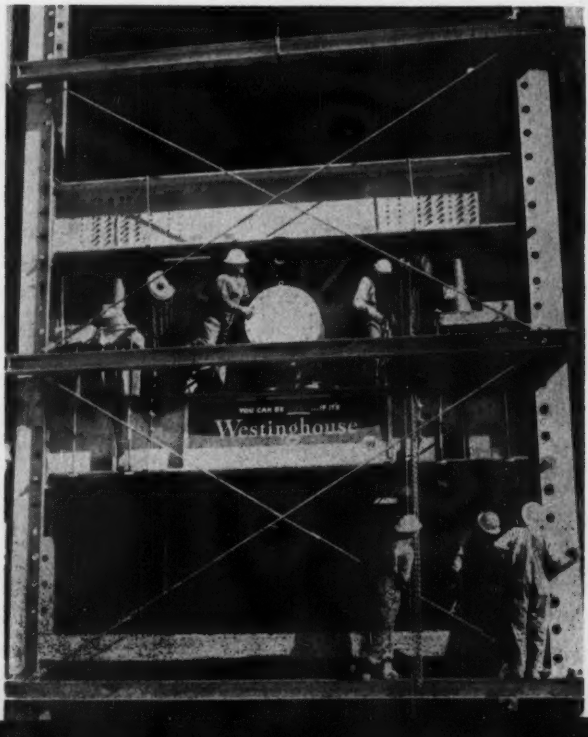
Horizontal I-beams were bolted to each pair of the vertical beams, with two located transversely to the generator just above the railroad car and two above the generator. These beams were spaced just far enough apart to provide room for the hydraulic



240-MW GENERATOR shipped with rotor in place was positioned within the lifting structure. Shipping of the complete unit cut the cost and saved considerable time



LOWER HORIZONTAL BEAM bolted to vertical legs provided a platform for hydraulic jacks. Another beam in the back also supported two hydraulic lifting jacks



LIFTING PROCESS consisted of a series of 12-in. steps. The top beams supporting the generator were jacked up and bolted, after which the lower beams were raised

Generator 27 Ft From Rail Car to Foundation

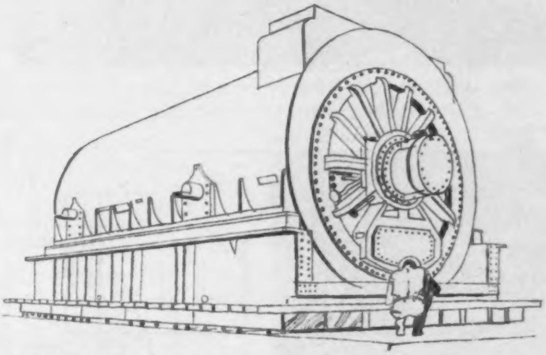
jacks in the compressed position. The four other horizontal I-beams were located longitudinally with and in pairs above and below the generator.

Tie rods from the stator were secured to the top horizontal beams. Then the hydraulic jacks, standing on the lower horizontal beams, were operated to take the weight of the beams and the generator. Bolts securing the top horizontal beams to the vertical beams were removed. The jacks were operated further until they neared the fully extended position.

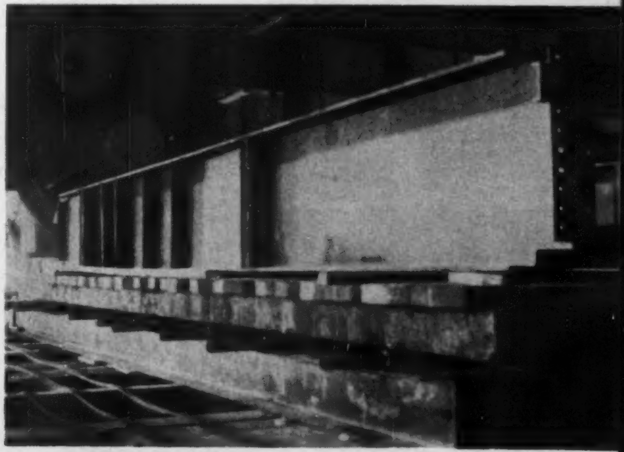
The top horizontal beams were then secured to the vertical beams so that they would take the weight of the generator off the hydraulic jacks. The jacks were compressed and removed and the lower horizontal beams were raised and bolted in position. The hydraulic jacks were again placed on the lower beams and the lifting process was repeated.

When the generator was high enough to move onto its foundation, a runway of I-beams was built under it and to the foundation. A sled was built, placed on rollers on the I-beam runway, and moved under the generator.

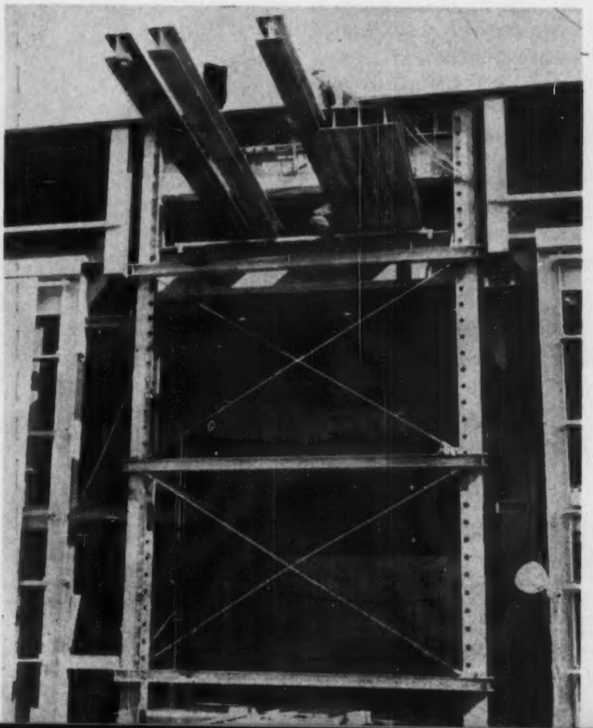
The generator on the sled was then skidded into position above its foundation. Then it was lowered onto its foundation by a process that reversed the lifting technique.



GENERATOR AND SLED were skidded over the runway to a position above the foundation. The generator then was lowered into position with a set of hydraulic jacks



FOR THE NEXT MOVE a sled was built of steel girders and timbers. The sled was moved on rollers into position, after which the generator was lowered onto it

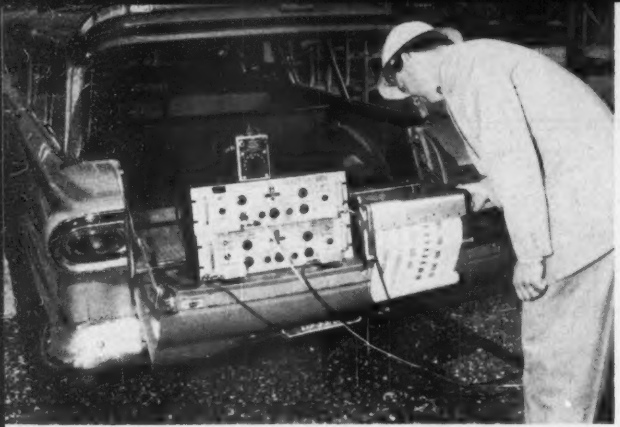


AT THE TOP OF THE LIFT a runway of I-beams was built under the generator. This runway extended into the power station and over the turbine-generator foundation

CIRCLE 111 ON READER SERVICE CARD

Oscillograph Checks LTC Circuit Functions

J. A. HEROLD, *Engineer, Electric Test Dept, Baltimore Gas & Electric Co, Baltimore, Md.*



A clear indication of the operating sequence of certain types of load tap changers is provided through use of the direct-writing oscillograph. The unit is admirably suited to show the functions of each switch and its relation with all other switches in the tap changer. Tests with the oscillograph may be made on the type of tap changer in which the transfer switches are used to make and break the circuit and the selector switches change the taps.

The oscillograph, contained in a 15x15x7-in. metal box, has six oscillograph elements which write directly on one common paper roll. This paper can be driven at speeds ranging from 1 to 250 mm per sec. By using appropriate amplifiers, the timing of all the tap changer switches is recorded directly on this one chart.

To test a load tap changer using the oscillograph, it is necessary to break certain connections in the tap changer circuits (Fig 1) so that operation of each switch will be recorded by its designated pen in the oscillograph. The supply circuit for the tests is any convenience outlet.

A test is made on only one phase at a time. As the voltage and current are low, battery clips and No. 18 wire are used to connect the instrument to the tap changer. After all connections are made and the oscillograph is adjusted, the tap changer is run through its entire range without stopping. This is done on both directions of the tap changer and for all three phases.

The chart of switch operation sequence (Fig 2) shows the interrelation of the function of the selector and transfer switches. The transfer switches are for load-break purposes and the selector switches are only for changing taps. The selector switch cannot be used for making or breaking load circuits. The chart shows that, as the tap changer progresses from one tap to another, the proper switches make and break their circuits, and on any particular tap the proper switches are closed.

This method of checking the operation sequence of tap changers was developed after a normal inspection of a transformer showed misalignment of contacts in the selector switch. Since the test results on this transformer were so satisfactory and the test was so simple, it was applied to other tap changers of this type as they were overhauled. In all cases the tests showed that the sequence of operation was satisfactory. However, the tests of one transformer did reveal an "open" in the tap changer circuit, which is shown in Fig 2.

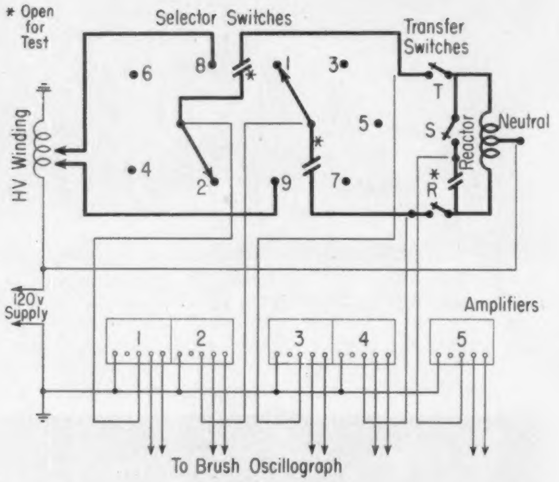
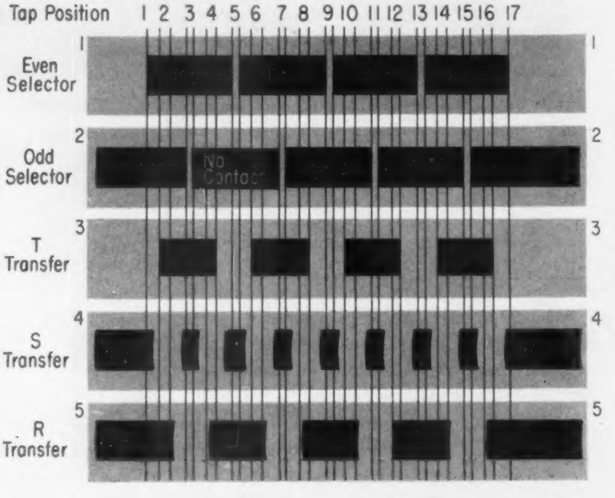


FIG 1—TEST CONNECTIONS of the LTC (one phase shown) show how the circuit must be segregated so that current will flow as the switches are opened and closed

FIG 2—TEST RESULTS on an 18-Mva, 110-13-kv LTC transformer indicates a malfunction. Open circuit with switch on tap 5 was traced to an open lead to the LTC



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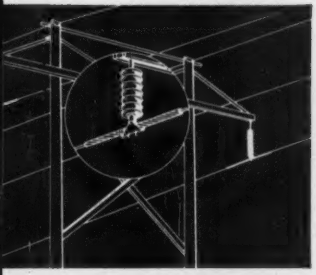

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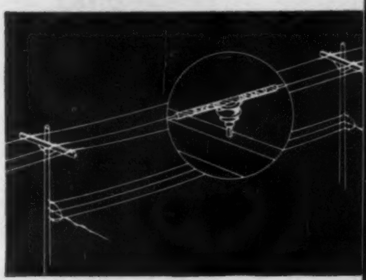
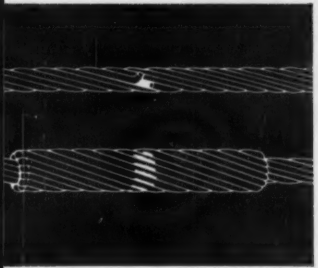


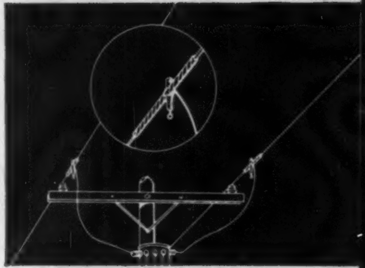


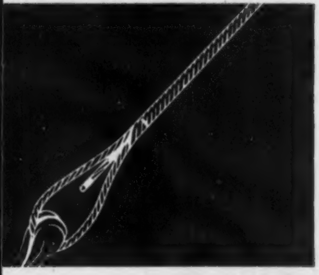
◀ PATCHRODS

Repair damaged or broken (up to 25% of strands) conductors, too far from support for Armor Rod to protect.

TAP ARMOR ▶

Protects where taps are required beyond extremities of Armor Rods on long spans or un-armored conductors.





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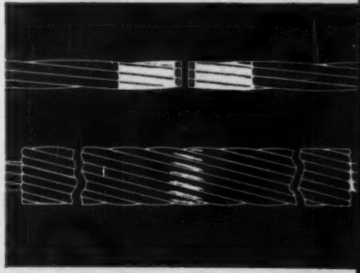

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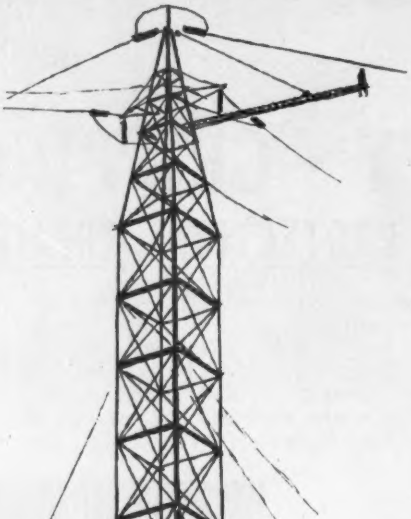
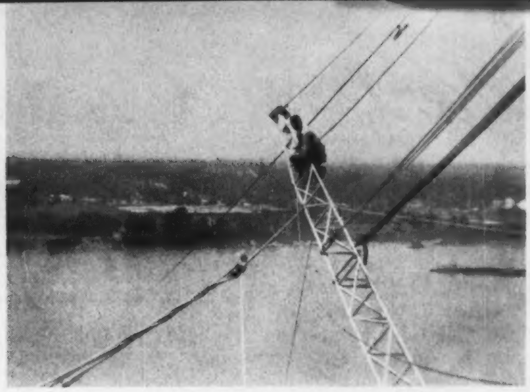
APPLICATION DATA

Specification and ordering are made easy by Fanner Superformed Products Catalog EP-8. Contains 48 pages of Selection, Application, Installation information.

CIRCLE 113 ON READER SERVICE CARD





Conductor on 405-Ft Tower Repaired From 40-Ft Boom

*J. N. STEPHENS, Electrical Engineering Supervisor,
Mississippi Power & Light Co, Jackson, Mississippi*

Special rigging of a 40-ft boom atop a 405-ft tower provided the means for inspection, repair and reinforcement of conductors on an interconnection across the Mississippi River between Mississippi Power & Light Co and Arkansas Power & Light Co. The special rigging allowed one lineman to repair and reinforce three ¾-in. Copperweld conductors at both ends of the 5,040-ft span, each in one week's time.

The aerial maintenance work was necessary after a routine inspection by Mississippi P&L turned up broken strands on the top conductor about 40 ft from the tower on the river side. Working from a small platform at the top of the tower, the inspector observed enough damage to classify it as serious. However, a closer inspection required special rigging independent of the damaged conductor. The rigging also would provide the means for inspection of all conductors and subsequent repairs.

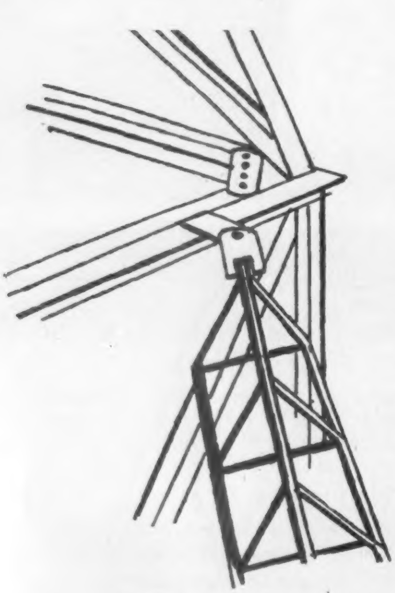
A boom was made from four 10-ft sections of a tubular, triangular TV antenna mast. It was attached at one corner of the transmission tower with a bracket that permitted pivoting in all directions. During the repair operation, the boom position was 20 deg above the horizontal for the top conductor and about level for the two bottom conductors.

Although only the top conductor was damaged, it was decided to reinforce all conductors. The damaged conductor was secured with two high-strength cable grips placed about 55 ft from the tower. The grips were fastened to the tower by four steel cables and four high-strength chain hoists which took up the 13,750-lb tension (at 60F) of the conductor. Steel yokes at the grips provided 18-in. cable spacing for work room.

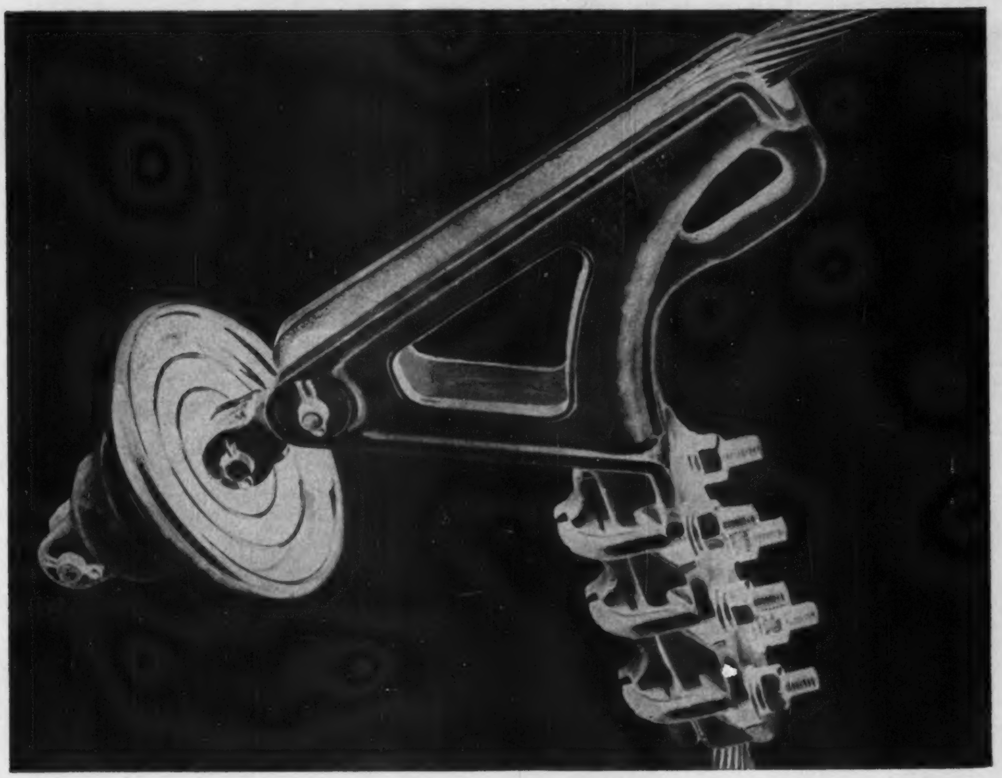
Repair and reinforcement were made by installing 22-ft preformed Copperweld armor rods clamped into the mechanical dead-end assembly at the insulator string. The rods were extended about 7 ft past the damaged point and 5 ft past the last damper. The installation was designed to restore full conductor conductivity and strength, to avoid discontinuities, and to avoid interference with dampers.

Armor rods were passed out to the lineman through rope loops around the conductor. Three strands of each preformed rod set were installed at one time, starting at the center and working in each direction. The boom was raised or lowered by the lineman as required.

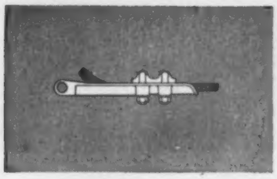
First estimates were that two or three linemen would be required for the job. However, only one was used, with each terminal of the crossing requiring one week for the job.



◀ **SPECIAL BRACKET** on the 405-ft tower allowed the 40-ft boom to be pivoted in any direction

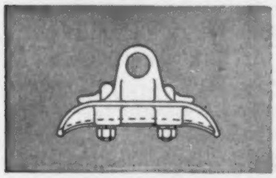


WHAT'S IN A BETHEA CABLE FITTING?



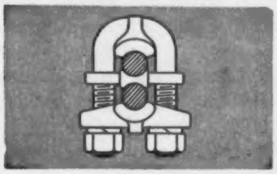
QUALITY–

A Bethea transmission size strain clamp (ADE-27) picked at random from a production run was tested by Pittsburgh Testing Laboratory for ultimate strength. This clamp is RATED at 35,000 lbs. It BROKE at 50,500 lbs.



DESIGN–

Bethea's short quadrant dead end series, designed and produced eight years ago, has been imitated but its effectiveness has yet to be equalled.



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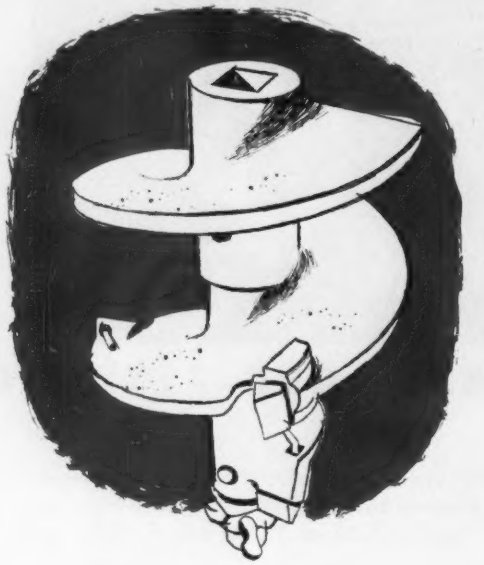
CONSTRUCTION



Auger Digs Fast In Rocky Ground

Pole holes in rocky, soupy or frozen ground can be dug easier and in less time with a new auger proved in the field by construction crews of New York Telephone Co's Nanuet District. Their experience can be of value to other utilities which dig holes under similar conditions.

The Nanuet District, in southeastern New York, contains a broad range of ground conditions—loam, gravel, hardpan, red-rock, frost, and granite lumps—but the greatest problem is earth interspersed with granite boulders. Division line foreman, Charles Smith, tried the PolarBore, designed by Trainer Associates primarily for frost digging.

The auger has a lower frontal area, with a helix aided by special cutting teeth set in two flights. Changeable penetrator points are designed for handling frozen ground or solid rock, or for working into boulder interspersed soil.

To eliminate cutting-teeth bolts that wear or become deformed, the auger has individual teeth held in place by soft-steel locking lugs which pass through the tooth sockets. With a hammer or screw-driver, a tooth may be replaced and the lug bent into place. This method, points out Safety Engineer John R. Pachler, is a real safety feature.

Walter Wanamaker, drilling crew chief, explains that by inching the auger for several partial turns when a boulder is struck, a granite lump longer than the diameter of the hole can be eased out. "It's amazing," he comments, "the way it can worm by the big ones and float them up." Foreman Smith points out that "with other augers we'd have had to enlarge the hole with succesive parallel bores. Almost invariably hand work would've been required."

Another problem in Nanuet District is soupy ground, where pumps and hand digging ordinarily are required. Says Smith, "Wherever we can get the machine over the hole, we can use the auger. In very wet ground it doesn't even bring out much of the hole; we set the pole without scooping, digging or pumping." In ground frozen hard, Smith comments, "The PolerBore works the lumps loose and gets through the frost line in good time."

(More Construction on page 118)

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More than 13 years ago Bartlett successfully pioneered the use of the helicopter for shade tree spraying—an operation that was to lead the way, a few years later, to a new efficient method of control of woody plants along utility rights-of-way.

At first, difficult terrains presented unusual problems but gradually through research and experience, new equipment was developed and new herbicides and techniques perfected to overcome them. Today, Bartlett research in this important field is carried on continuously through college fellowships and at the Bartlett Research Laboratories.

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AIR DART METHOD uses metal and rubber "darts" propelled by gas to pull rope through duct line

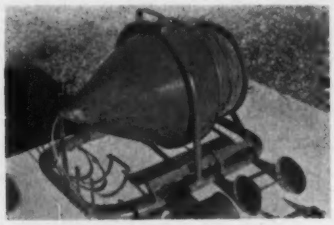
Air Dart Cuts

S. J. HAMPTON, *Chief Electrical Engineer,*
N. J. CHRISTOPHERS, *Meter Supervisor, Electric Light & Power Distribution System, Edmonton, Alberta*

A new method of duct rodding may completely change all previous practices in threading and rodding duct and conduit lines. This method is so fast that it cuts duct rodding cost by at least 50%. Rodding now can be done in less than half the time required by older methods. With this device, called the "Air Dart," a 650-ft length of 4-in. fibre duct was rodded in 25 sec; a 500-ft length of 4-in. Korduct conduit was rodded in 20 sec.

The principle in this method is to propel a "dart" through the duct line with compressed air or nitrogen. The cart consists of double funnel-shaped metal-rubber air cups designed for maximum speed in the duct. A pneumatic duct plug is used to prevent escape of the propelling

AIR OR NITROGEN from a cylinder may be used to run up to 1,000 ft of nylon rope through a 2-in. duct



NYLON ROPE REEL is designed to pay out rope at 100 fps. A guide prevents the rope from tangling

Rodding Cost 50%

gas. When the gas passes through the center of the plug, it expands the sides to form a gas-tight seal. A nylon rope brought through another hole in the plug is attached to the dart.

The rope take-off reel, designed for speed and safety, can feed nylon rope into the duct at 100 fps. A guide arm on the reel prevents tangling of the nylon rope. The reel has two operating positions. The open position is used for manually rewinding the nylon rope. The closed position is used when shooting the dart through the duct.

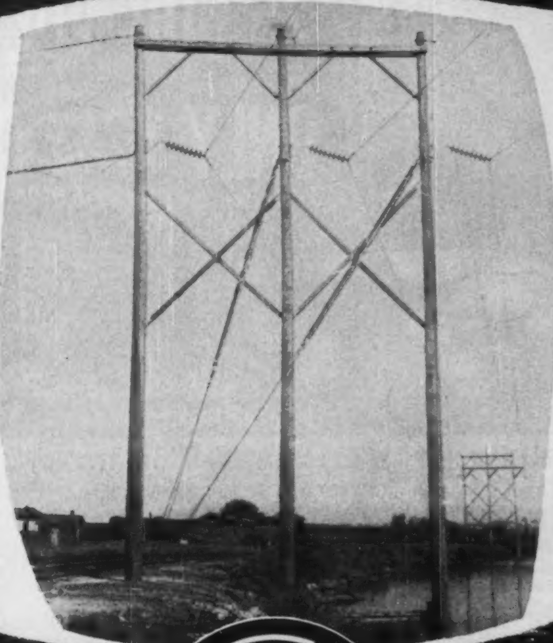
The air dart has five sizes of darts and plugs suitable for 4-in., 3-in., 2-in., 1½-in. and 1¼-in. conduits. Darts and plugs can be made for any other size of conduit. Various strengths of nylon rope are used depending on the pulling strength required.

Compressed air or nitrogen may be obtained from a gas cylinder or a compressor. Nitrogen in a cylinder has been found to be most successful up to and including a 2-in. conduit for lengths up to 1,000 ft. A compressor has been used successfully on all 4-in. duct runs.

Small obstructions in the conduit will not interfere with the dart's progress. Large obstructions, however, may stop the dart, in which case it is simply pulled back and the obstruction removed. The Air Dart method, invented by the authors, was proved in on the Edmonton distribution system.

CIRCLE 81 ON READER SERVICE CARD

(More Construction on page 120)

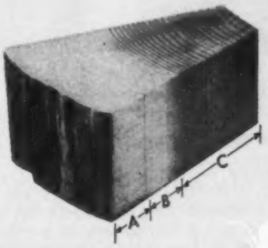


You can be sure when you install Life Span Western Red Cedar Poles!

... even where the most severe decay conditions exist

LIFE-SPAN'S thermal top-to-butt treatment permeates the ENTIRE sapwood... assuring longer pole-line service regardless of adverse installation or weather conditions. Besides being completely immune to decay, LIFE-SPAN Poles are clean, safe to climb and are carefully selected for uniformity and quality.

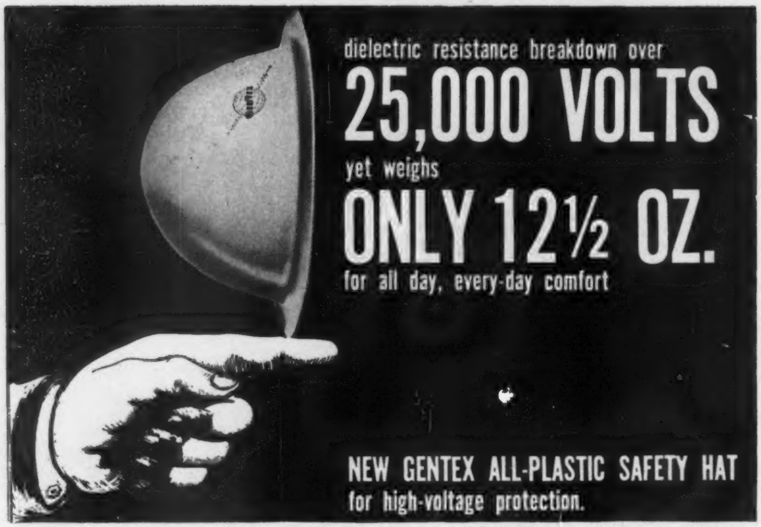
Want added years of pole-line service at far less per annum costs? Specify LIFE-SPAN Western Red Cedar Poles when you buy.



Actual laboratory tests **prove** . . . pentachlorophenal permeates both inner sapwood and outer sapwood the LIFE-SPAN way, making it impossible for the sapwood to decay under the most severe conditions. The above is a section taken from a Western Red Cedar pole after **years** of actual pole-line service under adverse conditions. It shows **(A)** the outer sapwood, **(B)** the inner sapwood and **(C)** the heart wood—all in perfect condition.

PAGE & HILL, Inc.
Minneapolis 3, Minnesota

CIRCLE 119 ON READER SERVICE CARD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yet weighs
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NEW GENTEX ALL-PLASTIC SAFETY HAT
for high-voltage protection.

more protection with less weight through GENTEX research-for-safety

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CIRCLE 162 ON READER SERVICE CARD

Upgrade relay test methods
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MODEL JR4

MANUFACTURED IN ACCORDANCE WITH, OR FOR USE UNDER U.S. PATENT #2,735,979

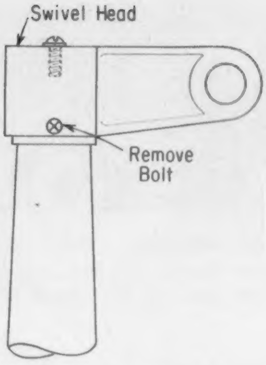
Reduce "set-up" time for relay testing to minutes with portable . . .

Send for detailed literature

Multi-Amp Cat. No. JR-4. Multi-Amp eliminates sprawling test apparatus, confines instrumentation to a single enclosure for quick and efficient testing of relays. Test unit is a continuously adjustable current or voltage source. Complete metering and timing instruments to monitor output. Several Multi-Amp models to meet all relay testing requirements.

Multi-Amp insures **continuous power for continuous production.** Saves man-hours, eliminates involved circuitry, speeds "set-up" time. Features complete portability, ease of use, safety. Standard models from 0.1 to 100 KVA for most applications; custom-engineered units as required.

MULTI-AMP Division
MULTI-AMP ELECTRONIC CORPORATION
465 LEHIGH AVENUE UNION, NEW JERSEY



Swivel Head Makes

***ASA C. RANDALL**, Clerk, Green Mountain Power Corp, Montpelier, Vt.*

Modification of the stationary head of a standard transformer gin to a swivel-head type provides the lineman on the pole with a more useful tool. The swivel head allows a transformer to be moved to one side or another to avoid other equipment on the pole during lifting or lowering. The modification does not affect the safety factor or capacity of the gin.

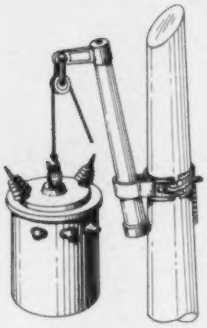
A standard gin was modified by first turning down the top of the gin pole to a taper. Then a metal ferrule (or pipe) was turned

Low Cost Plastic

For wiring installations and repair jobs, an East Coast utility is using up to 1,000 ft of semi-rigid plastic conduit each month. The plastic tubing is less expensive, easily installed and durable. It is made by Triangle Conduit and Cable Co from Kralastic, an ABS polymer.

Conduit is used for runs from transformers under cross arms and along poles to secondaries. It also is used for all wire components in 120-v street-lighting circuits. Linemen work with standard lengths of conduit, cutting them with hacksaws to fit, or with pre-cut lengths. Conduit is fastened with staples.

Flexibility of the plastic conduit permits simple bends that are impossible or difficult with rigid



Gin More Useful

on a lathe to fit like a bushing inside the gin eye cap. A cap was welded to the top of the ferrule which was then turned to a smooth finish.

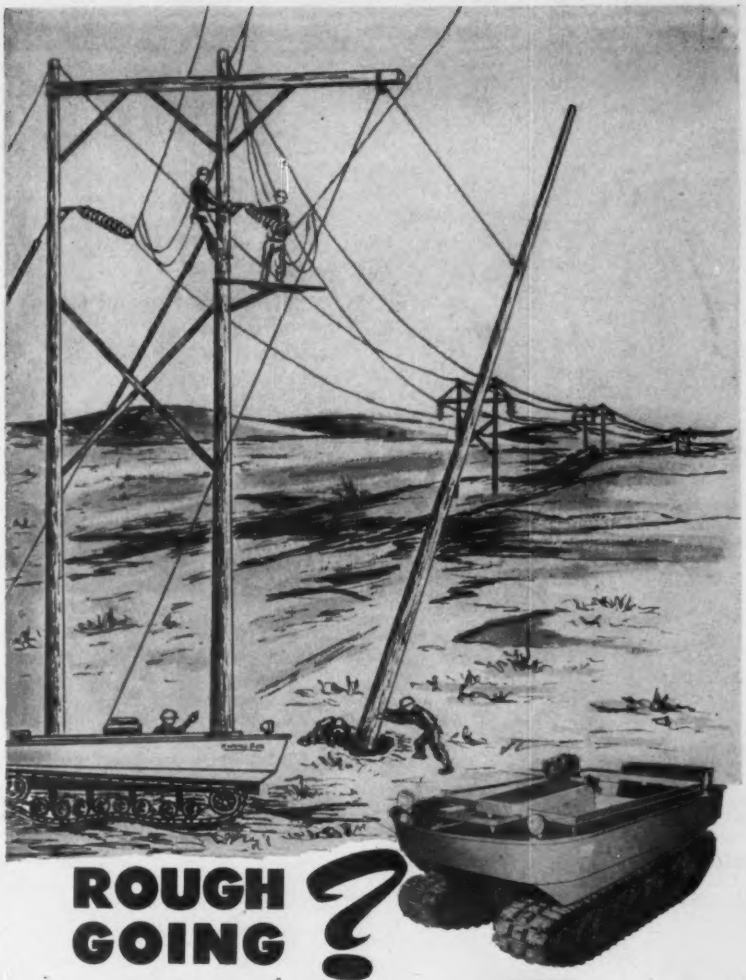
A hole was drilled through the center of the eye cap and the ferrule cap to take a 2-in. long wood screw. This screw and a washer hold the eye cap on the gin pole when it is being handled or carried. So well has this modified gin worked in the field that practically all transformer gins used by the company are being made over in the same manner.

CIRCLE 82 ON READER SERVICE CARD

Simplifies Wiring

conduit. Strength of the tubing allows replacement of 2-in. diameter ceramic conduit with 1-in. plastic conduit. The plastic tubing has about one-seventh the weight of metal.

CIRCLE 83 ON READER SERVICE CARD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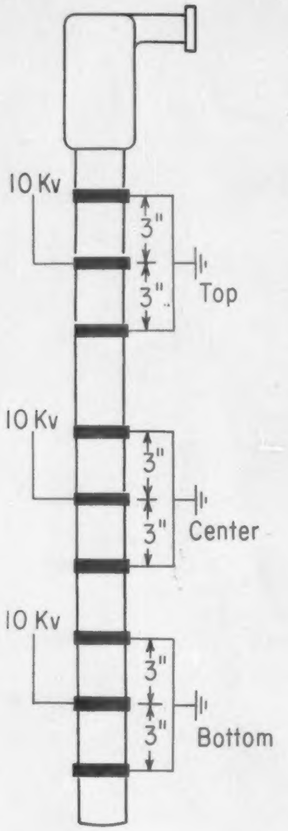

Tests Show Wet Sticks

G. R. DEINEMA, *Maintenance Engineer, Northern States Power Co, Minneapolis, Minnesota*

Switch sticks maintained in good condition may be used for the operation of hook-type disconnect switches on a 69-kv system during a rain storm. There is no hazard involved in operating the switches with sticks, even with wet sticks before they have been reconditioned. This conclusion is drawn from results of leakage-current tests made by Northern States Power Co on switch sticks under simulated rain conditions. Tests were made on sticks before and after they had been reconditioned, with results compared with those for a new switch stick.

A spray or water mist was applied to simulate rain during two sets of tests made on 10-ft switch sticks. In the first phase, Test A, three sets of three metal bands each were placed around the switch stick as illustrated. A potential of 10 kv was applied to the center band of each set.

For the second phase, Test B, a metal band was placed on the stick at each end and a third band was placed at the center. A potential of 10 kv was applied to the center band and the other bands were grounded.

Resistance of the stick was calculated from the highest leakage current reading obtained. In Test B, the highest leakage current was with the wet stick before reconditioning. A reading of 0.40 w at 10 kv indicates a resistance of 1,000 megohms for the full length of the stick.

Assuming that three-fourths of a 10-ft stick would be in the circuit when used on 69 kv, the resistance between the operator's hands and the disconnect would be 750 megohms. Excluding human body resistance and the resistance of rubber gloves, a current of 0.053 milliamp would

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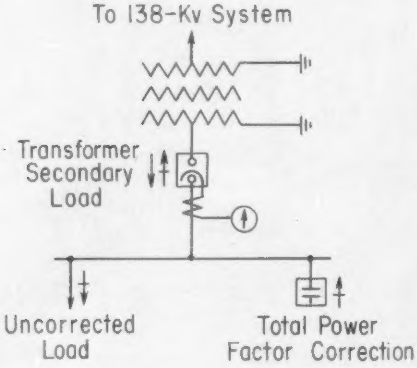


New Minimum Settings Handle

B. R. KLETT, *Commonwealth Associates Inc*
G. S. RIDGE, *Consumers Power Co, Jackson, Michigan*

Establishment of new minimum acceptable settings for 90-deg connected directional overcurrent relays has helped solve the problem of incorrect operation. By comparing the minimum acceptable setting, from the standpoint of overriding leading power factor loads, with maximum allowable setting to insure operation for faults, all relays can be reviewed quickly.

Need for new minimum settings was brought about by the increasing use of static capacitors and the subsequent greater probability of leading power factor loads. The problem was first noted on the Consumers Power Co system when two separate incorrect operations of directional overcurrent relays were experienced. In both cases, relays provided backup protection for transformers as shown in the diagram. A study of all directional overcurrent relays, made jointly with Commonwealth Associates, Inc, determined the adequacy of each installation and remedies to prevent this type of outage.

System var supply is not designed to create a leading power factor load situation. However, a leading power factor can be precipitated by sudden changes in system voltage, substation loading changes accompanying the tripping of a heavily loaded feeder, or loss of a transformer in a multiple transformer substation. The low current tap setting necessary for dependable operation on minimum current for transformer high-side faults makes directional overcurrent relays extremely susceptible to misoperation during the above load conditions. These limitations were evaluated in terms of the vars available to the substation bus from the low-tension system.

Can Switch Safely at 69 Kv

flow through the stick. According to recognized authorities a current of 5.0 to 15.0 milliamp causes unpleasant stimulation of the muscles. Thus, for a leakage current of 0.053 milliamp the safety factor is about 100.

The test results emphasized the importance of maintaining switch sticks properly. Sticks in good condition show very little increase in the watts loss after applying a mist of water. Leakage current readings obtained on the reconditioned stick are as low as those on new sticks.

However, on the stick to be reconditioned, the watts loss is normal when the stick is dry, but increases rapidly when a mist of water is applied. On a stick with a poorly varnished surface, dirt accumulates in the cracks and establishes a conducting path near the surface when wet. For the third set of tests on the used stick, a surface flashover resulted and the test set tripped out.

Tests Compare Resistance of Used, Reconditioned and New Sticks

	Used Stick				New Stick		
	Before*		After*				
Portion of Stick Tested	Microamp	Watts	Microamp	Watts	Microamp	Watts	Remarks
Test A—Potential of 10 kv between each set of bands and ground							
Bottom	70	0.14	60	0.11	60	0.15	Tests on clean, dry sticks
Center	60	0.09	60	0.13	60	0.13	
Top	60	0.10	60	0.18	60	0.16	
Bottom	140	0.35	60	0.15	210	0.45	After applying water mist to sticks
Center	150	0.60	60	0.14	90	0.48	
Top	140	0.40	60	0.19	70	0.25	
Bottom	..	..	60	0.12	70	0.35	After pouring water over sticks (1)
Center	..	..	60	0.12	60	0.14	
Top	..	..	60	0.16	70	0.23	
Test B—Potential of 10 kv between center of stick and grounds at each end							
Entire	140	0.40	50	0.05	50	0.06	Sticks still wet

*Before and after used stick was reconditioned and varnished.

(1) Arcs formed in cracks to ground on used stick; test set tripped out on all three tests.

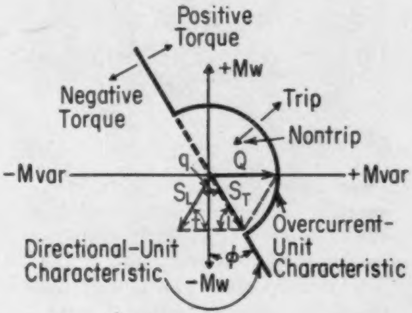
Leading PF Load

Typical characteristics of the 90-deg connected directional overcurrent relay are plotted in the relay diagram in terms of Mw, Mvar, and Mva. The semicircular portion represents the Mva equivalent of the maximum allowable overcurrent unit setting still affording protection. Angle ϕ represents compensation on voltage shift through the use of resistors in series with the directional unit voltage coil. This is generally 30 or 45 deg.

Superimposed on the relay characteristics are values of Q (the total of all low-voltage system power factor correcting capacitors), S_L (the load plotted at its uncorrected power factor), and S_T (the phasor sum of Q and S_L, ie, the load seen by the relay at the transformer secondary).

In general, all uncorrected substation loads ranged in power factor from 0.85 to 0.90. Power factor correcting vars available at the substation low-voltage bus were determined from system records used to establish var requirements. Calculations indicated that the minimum acceptable relay current tap setting was 100% or 110% of Q, respectively, for the 45-deg and 30-deg compensated 90-deg connected relays. To this was added a 35% margin of safety to allow for off-normal voltages and differences in actual and name plate ratings of capacitor banks.

Relays found to be inadequate under the minimum acceptable settings were replaced with relays utilizing ohm-type directional units. Among other approaches is the use of a voltage-type fault detector in conjunction with ordinary directional OC relays.



S_L = Mva Load at PF_L

S_T = Relay Pickup Mva at Leading PF_T

Q = Mvar Available to Low Voltage Bus

Angle $q = \cos^{-1} PF_L + \cos^{-1} PF_T$

Angle $t = 90° - \cos^{-1} PF_L$

$$S_T^{*} = Q \times \frac{\sin t}{\sin q} = Q \times \frac{\sin(90° - \cos^{-1} PF_L)}{\sin(\cos^{-1} PF_L + \cos^{-1} PF_T)}$$

*A margin of safety should be applied

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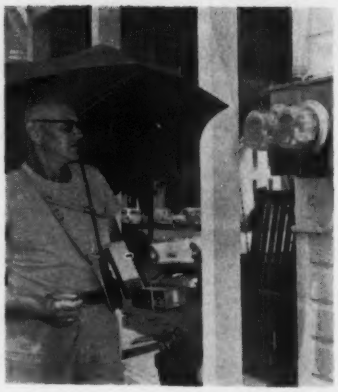
CIRCLE 124 ON READER SERVICE CARD



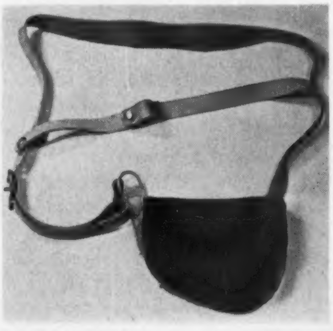
Meter Reader Gets 'Extra Hand'

D. D. MARTIN, Meter Reader, Ohio Power Co, McConnelsville, Ohio

When reading meters in inclement weather, meter readers can use an "extra hand" to hold the umbrella, thus freeing both hands to hold the card box and record readings on punched cards. In the Zanesville area of the Ohio Power Co, this extra hand is a leather holster which holds the umbrella and thus protects the cards against getting wet.

Made at a local harness shop at our request, the holster cost about $3.00. The handle of umbrella fits in the leather pocket and is held upright by a loop on the chest strap. A buckle permits adjusting the length of the suspension strap to the meter reader's size.

The holster encourages use of an umbrella in dry weather also as a shield against the hot sun. Other districts of Ohio Power are also adopting this holster idea.



(More Operation on page 126)

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Other trenchers dig "More or Less"

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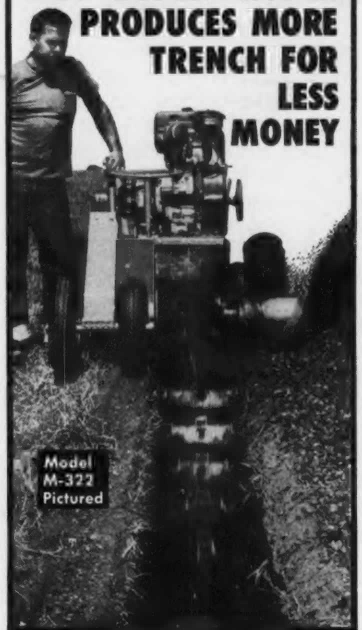

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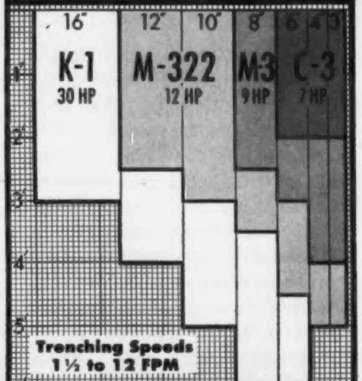

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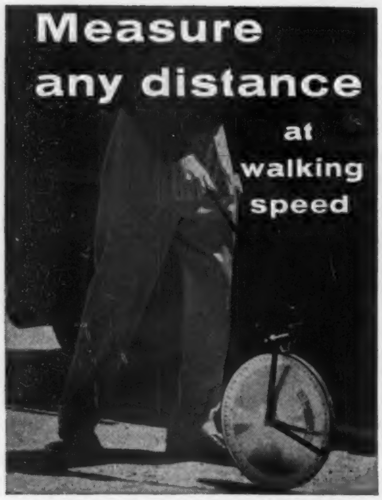

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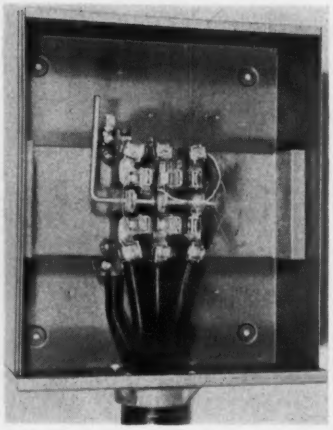

Metering Device For Class 200 Meter Takes 500-MCM Wire

S. B. VAUGHN, Supervisor, Meter Dept, Florida Power Corp, St. Petersburg, Fla.

A self-contained meter and cabinet are used by Florida Power Corp to serve customers whose service entrance conductors are larger than 4/0 copper but whose demand is small. The metering set is designed to take a Class 200 meter but may be modified at minimum cost to take a secondary current transformer installation. Each metering set installed initially represents a saving of about $150, plus annual savings in meter maintenance.

The self-contained set was required because it is Florida Power's policy to furnish the customer a meter device with the same current-carrying capacity as the customer's service entrance conductors. Former practice called for installation of CT's on all services exceeding 4/0 copper.

An analysis of 95 installations with service entrance conductors of 500 MCM, in service for a minimum of 12 months, showed that only three customers had a demand over 60 kw and that 90% of the demands were less than 40 kw. In all instances Class 200 meters would have properly metered these loads.

A device now is available,

(Continued on page 128)

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Metering Device

(*Continued from page* 126)

catalogued as an HQTS, that has an HQ block mounted in a standard trans-socket cabinet measuring 18½ in. wide, 22 in. high and 8¾ in. deep and equipped with a 3½ in. hub. In this device the 500-MCM conductors terminate in the HQ block mounted on a bridge to place the self-contained meter in the correct position. The connectors are 300-MCM terminals but sufficient strands are removed to allow the larger conductors to fit in the terminals.

However, the amount of conductor removed does not reduce the capacity of the wire to less than 200 amp, which is the capacity of the block and the self-contained meter. The manufacturer assures us that in the near future a 500-MCM terminal will be available that will not require reducing the conductor size.

Convert for Secondary CT

To convert the metering set to a secondary CT installation, the HQ block and bridge are removed and hardware is mounted to receive the 500-MCM conductor. A copper ring is added to the conductor to increase the current-carrying capacity to its original rating. Then the CT's and their secondary wiring and a new bridge with transformer-rated meter socket in place are installed. A transformer-rated meter protrudes through the cover the same distance as a self-contained meter.

On all installations of wire sizes from 250 to 500 MCM, the self-contained device is issued unless we are certain the demand will exceed 200 amp. A Class 200 meter is installed with a demand register that has been red-lined to indicate the demand above which a secondary CT conversion is made. This demand does not exceed the capacity of the conductor, meter device or meter. When demand exceeds the specified amount, Meter Dept personnel make the conversion. From the analysis made on this type of installation, we do not believe we will have to change more than 10% of the devices issued.

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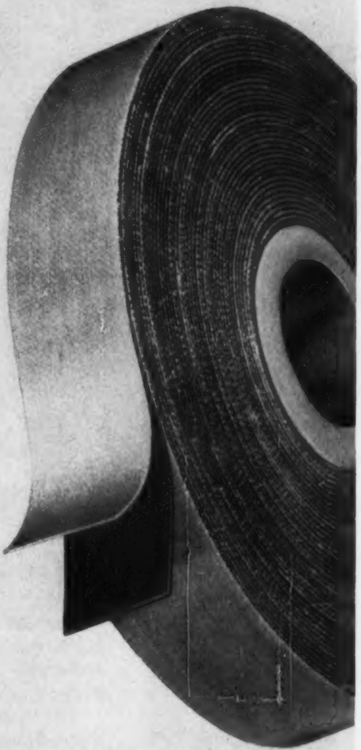

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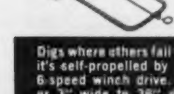
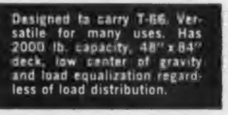


Digs where others fail because it's self-propelled by positive, 6-speed winch drive. Digs 2" or 3" wide to 36" deep; 4" wide, 18" deep. Proven to be profitable. Low cost.

the DAVIS HUSTLER UTILITY TRAILER



Designed to carry T-66. Versatile for many uses. Has 2000 lb. capacity, 48" x 84" deck, low center of gravity and load equalization regardless of load distribution.

The new, self-propelled, crawler-type Davis T-66 is the most advanced utility trencher available. It's designed and produced after an exhaustive survey revealed the features users really wanted. Every one of its 1350 pounds is packed with performance to handle 9 out of 10 jobs with amazing efficiency and economy; yet, it's priced much less than you would expect.

Positive traction, accurate speed control, hydraulic variable speed drive, hydraulically operated boom, preloaded shock-absorbing boom, convenient — virtually effortless — control, and compact design (only 37" wide) are just a few of its 33 profit-producing features.

It digs 3" to 4" wide to 66" deep or 12" wide to 30" deep, and at varying depths and widths in between. It trenches from 1-ft. to 12-ft. per minute depending upon soil conditions. Only **two** different **tooth combinations** are required to **handle all digging widths.** The Davis T-66 is quality built in every part.

ASK ABOUT ITS 90-DAY UNCONDITIONAL GUARANTEE

DAVIS MFG. INC.
1505 SOUTH McLEAN BLVD. WICHITA 13, KANSAS

Please send me literature and name of my distributor on the Davis T-66_____ Davis Pup_____ Davis Hustler Utility Trailer______.

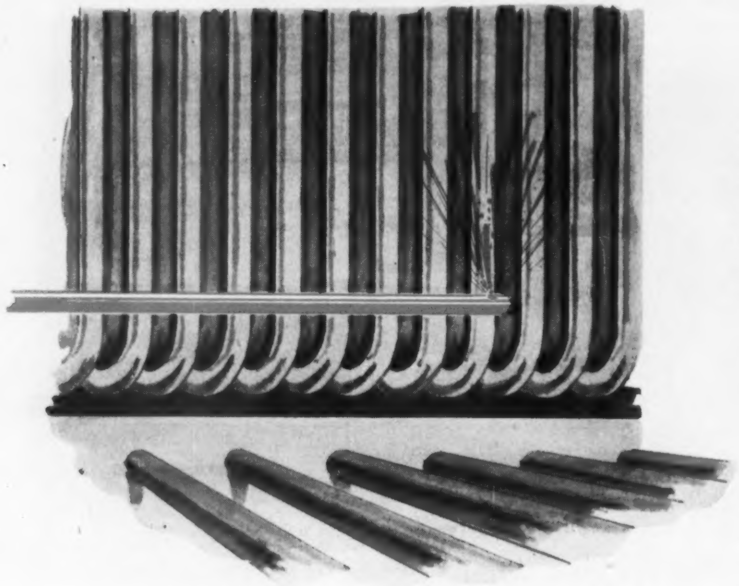
NAME______________________________

ADDRESS____________________________

TOWN________________ STATE__________

T6-60-2

CIRCLE 129 ON READER SERVICE CARD



Slurry Spray Cuts Cost of Cleaning Boilers

J. W. KECK, Superintendent of Power Plants, Florida Power & Light Co, Miami, Florida

A new method of reducing slag deposits and neutralizing acids on the fire-side surfaces of high-pressure oil-fired boilers has been developed in the generating plants of Florida Power and Light Co. The new method and equipment reduce high-pressure boiler cleaning from many man-hours to a minor detail during outages. Boiler cleaning operations now are usually performed by one man in 12 hr or less.

This method has been tested on 40 boilers in nine stations for over a year. It consists of spraying a fine mist of water and magnesium oxide slurry on the boiler surfaces while the boiler is in operation. Spraying can be done automatically by modifying standard soot blower installations.

In addition to the great reduction in cleaning costs, these other advantages have come to light:

- Daily coatings effectively reduce stack emission. They also indicate a reduction of about 30F in the acid dew point of flue gases. Tests are underway to determine if greater dew point depression can be accomplished by increasing the frequency of coatings at selected locations in the boiler.
- Periodic coatings effectively reduce metal wastage in furnace, superheater, reheater and economizer tubes from high temperature corrosion. However, superheater and reheater hangers and other boiler parts in high temperature zones not water-cooled do not receive adequate protection from slurry coatings to prevent excessive deterioration.

The complete spraying system includes provisions for storing, agitating, pumping and delivering the magnesium oxide slurry to soot blower units, and for purging the slurry piping after operation. It also includes soot blower units modified for spraying the slurry. The soot blower control panel must be converted for control of the complete process. The steam pressure regulating valve must be modified to provide steam pressure adequate for slurry injection.

Present practice at Florida Power & Light provides for one slurry application per day for furnace, superheater and reheater tubes. One application is made per week for economizer tubes. Variations in these schedules sometimes are made if conditions seem to warrant them.

Boiler surfaces, appropriately processed, remain sufficiently deposit-free to permit continuous operation at about the manufacturer's guaranteed performance from one annual boiler outage to the next. Slurry coating of boiler surfaces does not affect the fouling rates of air preheaters and dust collectors. This method of high-pressure boiler slag inhibition is protected by patent, with assignment made to Diamond Power Specialty Co.

(More Maintenance on page 132)

Of The Nation's Foremost Electric Utilities Protect Equipment With SUBOX Paints

For over 35 years Subox paints have been of increasing service to America's electric utility companies. Today they provide dependable corrosion protection for many billions of dollars worth of transmission towers, substations and other equipment. No other paints in the land protect like Subox, because no others are made like Subox. Only Subox contains suboxide of lead, a unique pigment that continues chemically active even after drying. It builds a tough, fibrous coating that withstands the most punishing exposures.

Subox paints are dependable. And they are economical: one or two coats do the work of two or three of ordinary paint, and a Subox application endures for an average of 6 to 8 years.

May we discuss your corrosion problems with you?

SUBOX PAINTS

Subox Inc.
Trade Mark

Established 1924 3 Fairmount Plant Hackensack, N. J.

CIRCLE 131 ON READER SERVICE CARD

GUIDANCE THAT PAYS

Problems are the trademark of every supervisor's job. How well he handles them is vividly reflected in your operating costs. There's no margin for error these days nor time for procrastination—not if you plan to operate at a profit. Decision-making must be swift and sure—based on the kind of good judgment you yourself would exercise under identical circumstances.

How fully equipped are your supervisors to meet their job problems, both old and new? Could their supervisory performance be improved, strengthened, reinforced? How well do they lead, accept responsibility, handle people? How broad is their management point-of-view?

Answers to questions like these invariably indicate the need for supervisory guidance—and this is where **MANAGEMENT INFORMATION** can be of valuable assistance to you.

Why not determine for yourself the value in **MANAGEMENT INFORMATION** by requesting your personal copy of "Guidance That Pays." Not just a brochure but a value-packed sampling of actual motivating material including:

- Creative Thinking
- Motivation Studies
- Self-inventory Charts
- Career Profiles
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Mount Vernon, N. Y.

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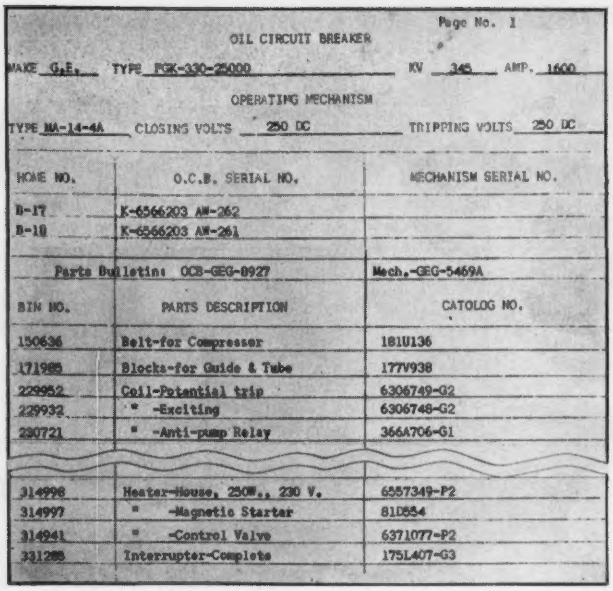


Page No. 1

OIL CIRCUIT BREAKER

MAKE G.E. TYPE FGK-330-25000 KV 345 AMP. 1600

OPERATING MECHANISM

TYPE MA-14-4A CLOSING VOLTS 250 DC TRIPPING VOLTS 250 DC

HOME NO.	O.C.B. SERIAL NO.	MECHANISM SERIAL NO.
B-17	K-6566203 AW-262	
B-18	K-6566203 AW-261	
Parts Bulletin:	OCB-GEG-8927	Mech.-GEG-5469A

BIN NO.	PARTS DESCRIPTION	CATOLOG NO.
150636	Belt-for Compresser	181U136
171985	Blocks-for Guide & Tube	177V938
229952	Coil-Potential trip	6306749-G2
229932	" -Exciting	6306748-G2
230721	" -Anti-pump Relay	366A706-G1
314998	Heater-House, 250W., 230 V.	6557349-P2
314997	" -Magnetic Starter	81D554
314941	" -Control Valve	6371077-P2
331288	Interrupter-Complete	175L407-G3

Simple Catalog Helps Find OCB Parts

***KENNETH F. SAYERS**, Substation Engineer, Indiana & Michigan Electric Co, South Bend, Ind.*

A simplified catalog of replacement parts has reduced the time required to find or obtain proper parts for making repairs on oil circuit breakers. The new catalog, started in October, 1952, is estimated to have saved as much as 2 hr per breaker outage. It also provides a ready means of reviewing spare parts stock.

Formerly, when a defective part was found, the crew foreman had no record of spare parts to refer to. From breaker nameplate data, manufacturer's parts bulletin reference, and a description of the part, provided by the foreman, someone would have to determine which part was needed and then review many storeroom bin cards to find the part. The problem was further complicated by the many different ways in which similar parts are described by manufacturers and by the many kinds of similar switches, gaskets, coils, etc.

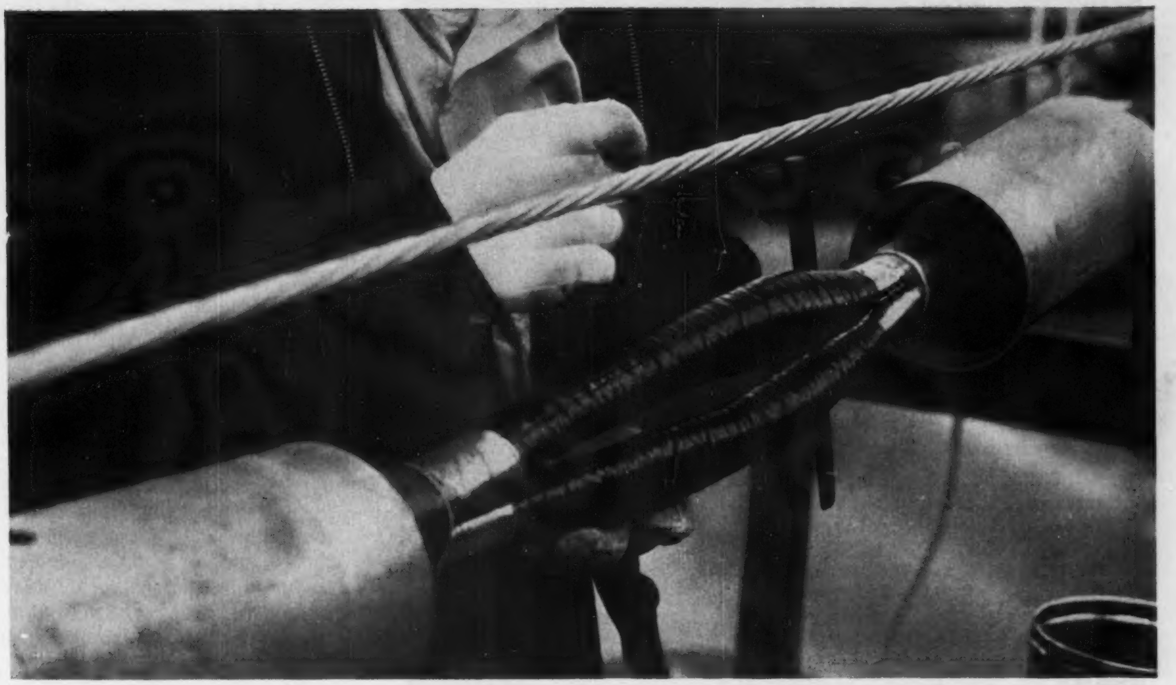
The simplified catalog lists all OCB replacement parts in stock and gives the stock bin number for each part. Each OCB is assigned a "home," or local, identification number. All similar breakers of the same make, type, rating, control, voltage and mechanism type are grouped on the same page, as illustrated. This page contains the OCB serial numbers, company home numbers, reference numbers of manufacturer's parts bulletins for both breaker and mechanism, bin numbers, manufacturer's catalog number and description.

The catalog is prefaced by an index giving breaker home numbers so that the correct page can be found quickly. The home number of each breaker also is entered on a corresponding record sheet for reference by the Engineering Dept.

Each OCB division foreman has one of the simplified catalogs. When he needs a replacement part, the foreman is able to identify the part from the catalog description. Then he calls in the correct bin number and description to the office.

After OCB repairs are made, an inspection report is prepared by the foreman. This later is checked for parts usage by a storeroom clerk to insure that parts used are restocked. With minimum quantities indicated on the bin cards, the storeroom can automatically maintain the necessary number of parts in stock.

(More Maintenance on page 134)



RUGGED YEARS AHEAD . . .

¾ INCH
No.10
36 YDS
SLIPKNOT PLASTIC
Electrical Tape
Plymouth Rubber Company
CANTON, MASS.
FREE CUTTER INSIDE
SLIPKNOT
PLASTIC
ELECTRICAL
TAPE
PLYMOUTH RUBBER COMPANY, INC.
CANTON · MASSACHUSETTS · U.S.A.

that's why the job demands

SLIPKNOT

Overhead or underground, every splice in a distribution line must be final, safe and *permanent*. SLIPKNOT PLASTIC ELECTRICAL TAPE, 7- or 10-mils thick, *handles easily, conforms readily,* and *snugs* and *stays down.* That's why it's found in the hands of the country's most experienced linemen — and *in all the best splices everywhere.*

With adhesive permanently anchored to vinyl base, with controlled tension for proper stretch without dangerous thinning — with absolute conformity in mile after perfect mile — no wonder SLIPKNOT is the specified plastic tape.

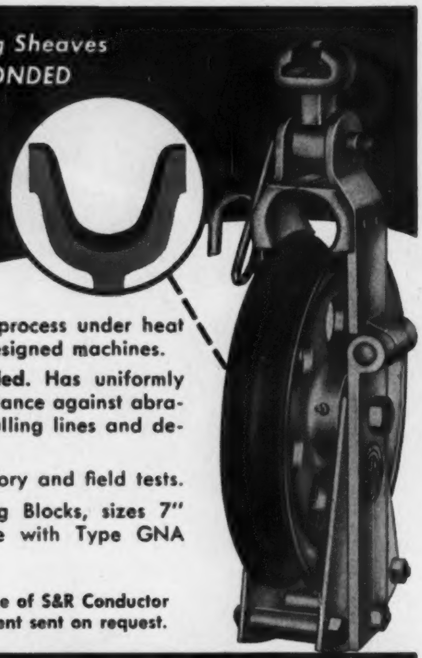
Try a roll today — with our compliments.

TAPES BY
SOLD ONLY THRU RECOGNIZED DISTRIBUTORS
PLYMOUTH RUBBER COMPANY, INC.

Samples for testing, with complete specification data, available on request. Please specify 7-mil or 10-mil. Write Division U on your business letterhead.

PLYMOUTH RUBBER COMPANY, INC.

QUALITY SINCE 1896 *Makers of* **SLIPKNOT FRICTION TAPE** *— most widely used in the world* **CANTON, MASSACHUSETTS**



Now, Conductor Stringing Sheaves
WITH PERMANENTLY BONDED

TYPE GNA NEOPRENE LINING

Molded by a vulcanization process under heat and pressure on specially designed machines.

Lining is **permanently bonded.** Has uniformly excellent properties for resistance against abrasive wear from wire rope pulling lines and deterioration from lubricants.

Proven by extensive laboratory and field tests.

All S&R Conductor Stringing Blocks, sizes 7" through 28", are available with Type GNA Neoprene Lined Sheaves.

NEW CATALOG on complete line of S&R Conductor Stringing Equipment sent on request.

SHERMAN & REILLY, INC. CHATTANOOGA, TENN.

SHERMAN & REILLY, INC.
ENGINEERS AND MANUFACTURERS
1st and Broad Streets • Chattanooga 2, Tennessee
Telephone AMherst 7-1273 • Teletype Exchange CT-7036

CIRCLE 166 ON READER SERVICE CARD

POW-R-SPADE
PORTABLE TRENCHER

- Low cost—light weight—portable.
- Stampings has over five year's experience in building trouble-free, productive trenchers.
- More in use than any other in its class.
- Shipment made 1 day after order.
- Completely assembled, ready to work.

Pow-R-Spade Guarantees Product and Performance!

For complete details —no obligation
TELEPHONE COLLECT
ROCK ISLAND
8-9527
or mail coupon

STAMPINGS, INC., Dept. O, Rock Island, Ill.
Please send details on POW-R-SPADE
Name ....
Company ....
Address ....

- Pow-R-Spade digs straight, curves, angles wtihout preliminary set-up.
- Low cost per foot—more profit per job.
- Minimum of working parts—hardly any maintenance required.
- Cuts neat trenches—easy back-fill.
- Digs trenches 3" wide to 24" deep—or 4" wide to 18" deep.
- Dealers in principal cities.

POW-R-SPADE IS MADE BY STAMPINGS, INC.

Metal Forms Repair

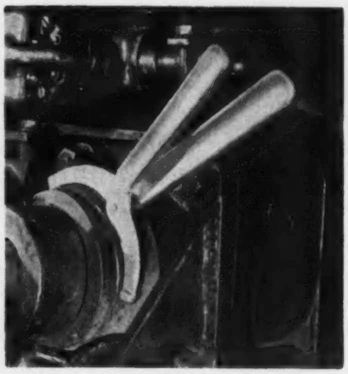
J. B. PRINCE, *Superintendent, Underground Distribution, Iowa Public Service Co, Sioux City, Iowa*

Metal forms made in halves solved the problem of replacing part of a multiple tile duct line housing live cables for Iowa Public Service Co. The galvanized sheet metal forms were used to replace a 3-ft section of six-way duct.

Past practice for the company was to use either split fibre or to split a section of multiple tile to replace the bad section. Split fibre was preferred due to its simplicity but changing from square to round and back again to square duct in a duct line can cause obstructions to duct rodding. However, the split fibre leaves no room between ducts for concrete.

To replace the bad section, we

Wrench Speeds



LLOYD VALENTINE, *Maintenance Man*
VERNOR GRAY, *Maintenance Man, Clifty Creek Plant, Indiana-Kentucky Electric Corp, Madison, Ind.*

Two spanner wrenches in combination provide a tool that speeds the maintenance of slag blowers and permits several jobs to be done with increased safety, economy, and less wear on the equipment. The new wrench tightly grips the large cylindrical parts that must be removed and retightened.

An ordinary spanner wrench is

CIRCLE 134 ON READER SERVICE CARD

Multiple Tile Duct

had galvanized sheet metal forms made up to fit into the ends of the good sections of multiple tile. These forms were made in halves. The bottom section had a groove constructed on the outside of each side into which the top section fit. These forms fit snugly into the ends of the multiple duct and left room for fine aggregate concrete to be puddled in.

Slag Blower Repair

difficult to use because the pin frequently comes out of the hole during turning. The hole wears and becomes distorted making it still more difficult to get a grip with the wrench. Many workmen receive mashed fingers as a result.

The solution lay in the joining of two spanner wrenches to form a pliers-like tool that distributes the pressure evenly around the cylindrical surface. The tighter it is squeezed, the more pressure will be exerted to hold the pin in place.

The new wrench was made by drilling a $\frac{5}{16}$-in. hole through 4-in. and 5-in. spanner wrenches at the start of the curve, to serve as a pivot point. These were riveted together with the curves facing in, as illustrated. The handle was cut from the 4-in. wrench and rewelded at an angle that would permit both handles to be together when the wrench is placed on the lance-joint packing gland. The pin was cut from the 5-in. wrench so that both wrenches will seat properly along the curved surface.

INCREASE

KVA 335%

Rebuild with new G-E Permalex* core and coils

Put new life into your obsolete or burned-out distribution transformers. The new smaller design low-voltage Permalex core and coil rated 15-kva, for instance, will now fit a 12-inch diameter tank formerly housing only a 5-kva. Because of the extra overload capability of the Permalex insulation system you can load this unit based on an equivalent 16.8-kva and thus obtain a full 335% increase in kva from the same tank. Similar increases are available on other kva ratings also.

Factory made replacement core and coil units offer you up-to-date performance, whether installed by one of General Electric's 55 Apparatus Service Shops or in your own repair shop.

Rebuilding distribution transformers can save you money. G-E replacement core and coils, as well as other replacement parts, offer you new transformer reliability and new transformer warranty. Contact your nearest G-E Service Shop Representative or G-E Sales Engineer for additional information. General Electric Co., Schenectady 5, N. Y. 485-01

* Trade-Mark of General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC

SOUTHERN STATES OFFERS THE MARGIN OF SAFETY NEEDED IN AIR SWITCHES TODAY AND TOMORROW

The switches shown here are brand new. They will pass any industry standard short circuit test with ease.

But what about 10 years from now, when the switches are covered by grime and grit; when operation has caused some wear of the contact surfaces?

What's going to happen *then*, when heavy fault currents occur? Are the critical current interchange points going to stand up to the task of protecting your valuable load?

These are questions that must be answered by engineers concerned with today's complex transmission and distribution problems. Basic switch design, quality of construction, and the type of contacts used deserve critical appraisal. The contact is most important.

Southern States provides extra security for its air switches by using Amplitact®contacts. Since this contact was introduced about 10 years ago, *not a single one has ever failed under short circuit*. This is the margin of safety you need.

Look beyond the catalog and technical data—look to the future capabilities and trustworthiness of the switch you buy.

High density, high load areas demand maximum protection against higher values of fault current. That is why so many utilities throughout the nation are using Southern States Air Switches with Amplitact Contacts.

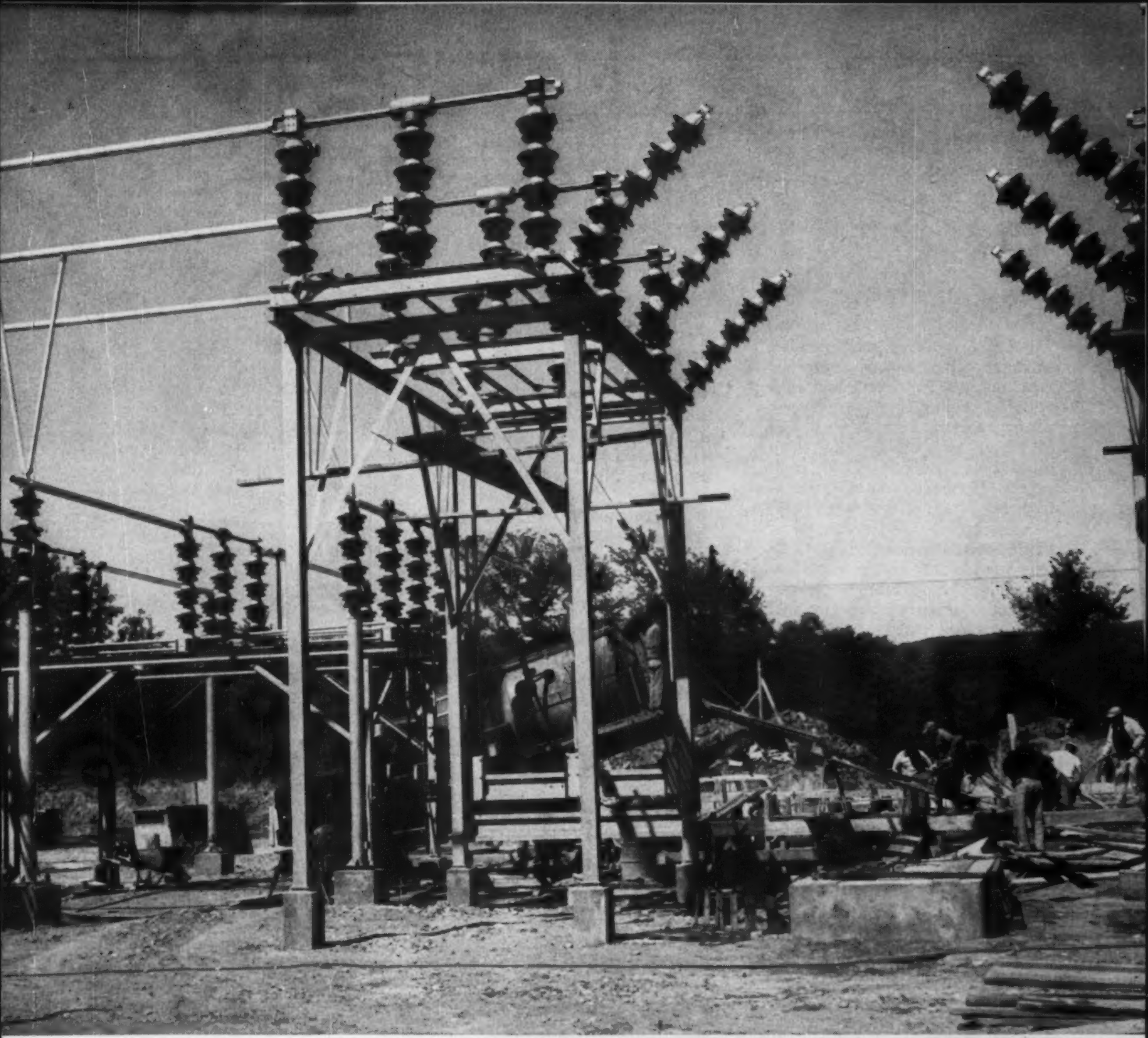
Get the facts from your Southern States representative, or write direct for details.

SHORT CIRCUIT TESTS OF SOUTHERN STATES SWITCHES EQUIPPED WITH *AMPLITACT* ® CONTACTS

KEEP PACE ELECTRICALLY

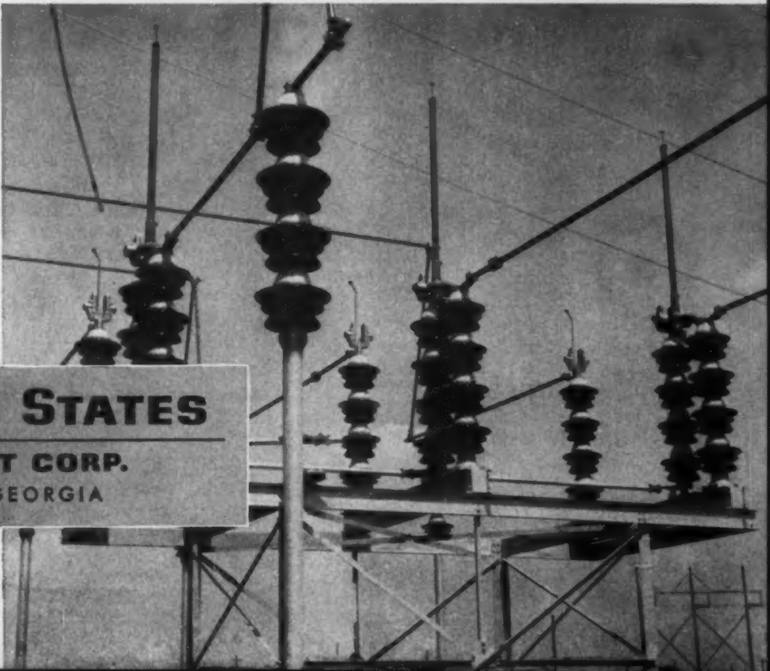
KV	CONT. CURRENT RATING	TEST SHOTS			TEST RESULTS
		NO. OF TESTS	RMS AMPERES MAXIMUM	RMS AMPERES MINIMUM	
161	1200	12 6 6 9 9 3	62,900 79,000 80,300 84,500 98,000 106,800	51,200 60,000 69,700 74,600 78,400 89,800	No Damage No Damage No Damage No Damage No Damage Pressure Marks*
161	2000	7	70,500	58,600	Pressure Marks*
161	1600	8 1 6	70,000 114,000 82,000	53,700 65,300	No Damage Pressure Marks* Pressure Marks*
161	1600	5	106,100	99,500	Pressure Marks*

******The term "Pressure Marks" should in no way be construed as an indication of damage to the contact. Instead it points up the extremely high contact pressures which were developed by* AMPLITACT® *and were anticipated in the design of this type contact.*



ABOVE Consolidated Edison's Buchanan Substation is shown here during construction. Southern States' 161 KV—2000 amp Type RDC double side-break switches and 230 KV—1600 amp Type WAG switches (not shown) are the Amplitact equipped air switches used on this station.

AT RIGHT Houston Lighting & Power Company uses 161 KV—1200 amp Type WAG air switches on this modern substation.



SOUTHERN STATES

EQUIPMENT CORP.

HAMPTON, GEORGIA

IN CANADA Dominion Cutout Co., Ltd., Toronto

CIRCLE 137 ON READER SERVICE CARD

MANUFACTURERS LITERATURE

To request literature, use code numbers indicated for each item when filling in Reader Service Card

CONSTRUCTION

TOOLS . . . hydraulic conduit benders, cable pullers, hydraulic knockout punch drivers and sets, portable high-pressure hydraulic power pumps. Also complete line of power bits, chisels and allied small tools. Bulletin E-240, eight pages. Greenlee Tool Co, Rockford, Ill. **(41)**

ELECTRODES . . . used with four models of Arcair metal removal torches. Employ special compound of carbon and graphite. Recommended current settings for welding machines given. Pocket brochure, six pages. Arcair Co, Lancaster, Ohio. **(42)**

EXCAVATOR CRANE . . . features new positive-pressure backhoe, positive rope crowd shovel attachment, magnet crane system. Clamshell permits handling long booms at long radii; dragline with free-spooling drums works with booms up to 50-ft long. American 200 Series Crawler Crane/Excavator, Catalog No. 720-CG-3, 20 pages. American Hoist & Derrick Co, St. Paul 7, Minn. **(43)**

CONTROLS

CLOSED-CIRCUIT TELEVISION . . . equipment includes cameras, housings, lenses, monitors, switchers, microwave equipment and new RCA television tape recorder. Catalog, 112 pages. Radio Corp of America, ITV-Dept 759, Bldg 15-1, Camden 2, N. J. **(44)**

MAGNETIC STARTERS . . . ac, Type CY, sizes 0 through 4. Combination starters, reversing and multi-speed starters, reduced voltage starters, non-reversing across-the-line starters. Clark arc-quenching principle, used on sizes 2, 3, and 4 starters, is fully diagrammed. Illustrations of enclosures, forms, and combinations. Bulletin, eight pages, Pub. No. PL 12-8-160. Clark Controller Co, 1146 E 152 St, Cleveland 10, Ohio. **(45)**

SUPERVISORY CONTROL . . . system, the ASCOP, for fingertip control of remote operations such as unattended substations. Details operating sequences for various types of control and supervision which can be specified. Brochure, 12 pages. ASCOP Div, Electro-Mechanical Research, Inc, Box 44, Princeton, N. J. **(46)**

BOILER CONTROL . . . used on 850-psig, 900F, outdoor Unit 7 at municipal lighting plant in Taunton, Mass., described, with schematic diagram of control circuits. Boiler delivers steam to 16.5-Mw turbine. Maximum continuous rating of boiler is 145,000 lb-hr, with peak loads 170,000 lb-hr and under fully automatic operation down to 40,000 lb-hr. It is fired with Bunker C oil, with provision for pulverized coal or natural gas. Bulletin 1065, 12 pages. Copes-Vulcan Div, Blaw-Knox Co, Erie 4, Pa. **(47)**

GENERATION

TURBOGENERATORS . . . large units treated comprehensively, from component design to controls and instrumentation. Includes table of typical ratings and arrangements of large-capability generators available today. Thirty-nine subject classifications. Bulletin 03B-9448, 40 pages. Allis-Chalmers Mfg Co, Milwaukee 1, Wis. **(48)**

DIESEL ELECTRIC . . . plants, 2, 5 and 7.5 kw, with one-cylinder, two-cylinder, and three-cylinder air-cooled diesel engines, respectively. First is 115 v ac; latter two 115/230 v ac. Booklet, Diesel Trio, eight pages. Kohler Co, Kohler, Wis. **(49)**

SILICON RECTIFIER . . . conversion units, oil-filled, for electrostatic precipitators and other types of h-v power supplies. Table of ratings, application data, prices. Bulletin GEA-7060, four pages. General Electric Co, Schenectady 5, N. Y. **(50)**

INDUSTRIAL TRUCKS

INDUSTRIAL TRUCKS . . . analysis of initial costs, operation, depreciation and maintenance. Based on average costs and working conditions. Comparison graphs of gasoline and electric trucks. Brochure, 12 pages. Lead Industries Assn, 292 Madison Ave, New York 17, N. Y. **(51)**

INSTRUMENTS

DATA LOGGERS . . . automatic, portable, the Data-Master. Tailored with off-the-shelf components for each requirement. Log temperature, pressure, flow, humidity and other conditions. Typewritten or punched tape record. Memory units and alarm systems can be incorporated. Brochure, 12 pages. Hanson-Gorrill-Brian, Inc, 85 Hazel St, Glen Cove, N. Y. **(52)**

INDICATING GAUGES . . . V5 series, miniature, vertical-type, with 5-in. scales for measuring and indicating draft, pressure, differential pressure, temperature, and pneumatic signals. Gauges available illustrated, with scales, ranges, mounting dimensions and lighting details given. Bulletin 59-1, 12 pages. Republic Flow Meters Co, Rockwell Mfg Co, 2240 Diversey Parkway, Chicago 47, Ill. **(53)**

TACHOMETERS . . . portable and hand, for general shop and laboratory testing of rotational speeds on almost any type of equipment. Eight standard ranges listed; special scales available. Bulletin T-101-50, two pages. Electro Mechano Co, 241 East Erie St, Milwaukee, Wis. **(54)**

TRANSMITTER . . . ElectriK Tel-O-Set differential pressure-to-current. Measures differential pressure ranging from 0-20 in. to 0.400-in. of water and transmits proportional 4 to 20 milliamp dc signal. Used with ElectriK Tel-O-Set recorders, indicators, controll-

(*Continued on page* 140)

SEAMLESS

- Long radius or short—the finest ells ever made . . . hot coined for dimensional accuracy from end to end
- Forged at controlled heat for superior metallurgical quality
- Specially machined ends for quickest fit-up and welding
- Ells, tees, returns—all types of fittings—available in seamless through 24"
- Produced by newest, most modern equipment, combined with latest technology in forging, sizing, heat treating and machining

Now... Midwest makes BOTH!

Formed from plate and welded—**fully reinforced** . . . same high quality as always

Especially suited for Long Tangent **bonus** elbows, reducing ells, and special fittings of unusual shapes

Stocked in carbon steel, wrot iron, chrome-moly . . . available in Hi-Yield and all other weldable metals

Wall thicknesses up to 4"—**or more**

Delivery from stock—with or without Long Tangents—in all sizes through 36"; to order, through 48"

The world's most complete line of welding fittings... for maximum flexibility in piping design

SOLD THROUGH STOCKING DISTRIBUTORS FROM COAST TO COAST

MIDV

PIPING COMPANY, INC.
1450 SOUTH SECOND STREET
ST. LOUIS 4, MISSOURI

CIRCLE 139 ON READER SERVICE CARD

New Irwin Pole-Bor Bit

gives non-stop boring

No stopping to clear chips, not even in creosoted poles

Now get easier, faster, non-stop boring action in telephone and power poles with the new Irwin 415T Pole-Bor bit. Chip flow is continuous. Special Irwin cutting head, twist angle, and smooth-polished hollows eliminate clogging and binding — even when boring clean through creosoted poles. Spur on head outlines hole ahead of cutting edge. Side lip then smooths hole, making it easier to insert bolts or pins.

And Irwin's exclusive and patented Adapter Shank chucks perfectly in both hand braces and electric drills to cut inventory costs by 50%, speed work on the job. All Irwin Pole-Bor bits are made of special high analysis steel, heat treated full length and machine sharpened for extra accuracy, longer life. Save time, save money. Order from your Irwin distributor.

Overall Length: Approximately 18", with 12" twist, 6" shank
12 Sizes: 9/16" to 1 11/16"

Irwin Adapter Shank fits both hand braces and electric drills

Comes like this with taper square shank for use in hand braces.

Cut off taper square shank. Use in both hand braces and electric drills. No wobble, no run-out.

IRWIN Wilmington, Ohio
every bit as good as the name

CIRCLE 140 ON READER SERVICE CARD

Transmitter

(*Continued from page* 138)

ers or actuators, with ElectriK Tel-O-Set I/P transducer, or with data handling systems or millivolt receivers. Bulletin Specification FS301-7, four pages. Minneapolis-Honeywell Regulator Co, Industrial Div, Wayne & Windrim Aves, Philadelphia 44, Pa. (55)

INSULATION

EPOXY RESINS . . . applied successfully to specific types of equipment, e.g., stators, armatures, field coils and transformers. "Specific Applications for Dolphon Epoxy Resins," 16 pages. John C. Dolph Co, Monmouth Junction, N. Y. (56)

INSULATING MATERIALS . . . for electrical equipment. Provides technical data and suggested use of mica mat, built-up mica, coated materials, varnishes, paints, adhesives, compounds, thinners, irradiated materials, wire enamels, and permafils. Ordering information and list of regional sales offices. Bulletin GET-2929A, 12 pages. General Electric Co, Schenectady 5, N. Y. (57)

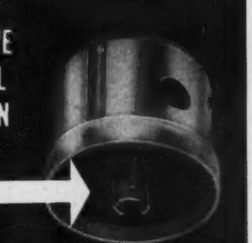
ELECTRICAL BOARD MATERIALS . . . asbestos ebony and ohmstone, two asbestos cement materials designed for low-voltage applications. Former is recommended for use in switchboards, controller plates, switch bases, bus-bar supports, and as insulating spacers at voltages up to 1.2 kv. Ohmstone is recommended for applications in which metallic or carbon dust tend to carbonize conventional electrical boards. Folder, IN-229A, four pages. Johns-Manville, 22 E 40 St, NYC 16. (58)

MAINTENANCE

POLE MAINTENANCE . . . using Chapman Pol-Nu, grease-type preservative and new bandage-maker machine for precision coating. Illustrations of penetration of Pol-Nu on various types of wood. For standing poles. Bandage-maker, offered only to users of Pol-Nu, may be obtained without cost. Folder, four pages. Chapman Chemical Co, Memphis 1, Tenn. (59)

(More Literature on page 142)

NOW!
"FLASHOVER" ELIMINATED
MODEL 5940 TUBELESS
EXCLUSIVE TERMINAL ISOLATION DESIGN



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CIRCLE 167 ON READER SERVICE CARD

New DISTRIBUTION TRANSFORMER TESTERS

MODEL TTS-250

Distribution transformers up to 250 kva capacity can be accurately tested with new MULTI-AMP Transformer Test Sets. Units may be used with all transformers having primary winding ratings of 2.4 to 15 kv and secondaries rated 120/240 v. Makes six measurements including primary voltages, exciting currents, no-load loss, high voltage output, polarity and ratio.

Standard models available to test transformers from 25 kva to 250 kva.

Write for Bulletin TTS-250.

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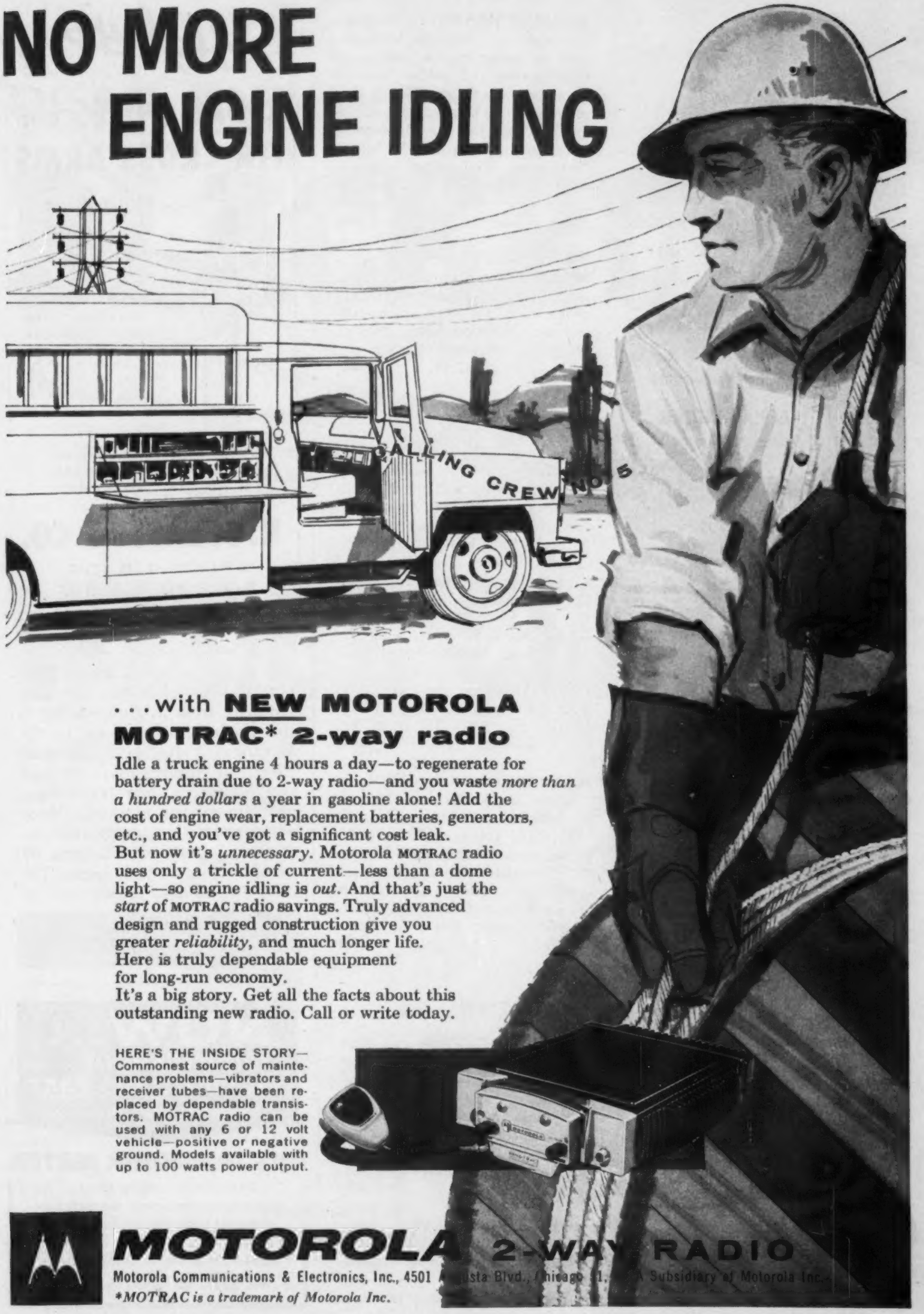

...with NEW MOTOROLA MOTRAC* 2-way radio

Idle a truck engine 4 hours a day—to regenerate for battery drain due to 2-way radio—and you waste *more than a hundred dollars* a year in gasoline alone! Add the cost of engine wear, replacement batteries, generators, etc., and you've got a significant cost leak.

But now it's *unnecessary*. Motorola MOTRAC radio uses only a trickle of current—less than a dome light—so engine idling is *out*. And that's just the *start* of MOTRAC radio savings. Truly advanced design and rugged construction give you greater *reliability*, and much longer life.

Here is truly dependable equipment for long-run economy.

It's a big story. Get all the facts about this outstanding new radio. Call or write today.

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MOTOROLA 2-WAY RADIO

Motorola Communications & Electronics, Inc., 4501 Augusta Blvd., Chicago 51, A Subsidiary of Motorola Inc.

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CIRCLE 141 ON READER SERVICE CARD

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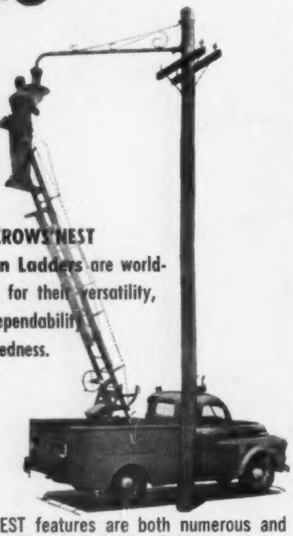
Quickly, Easily, Safely
with A
crows'nest
The High-Performance
AERIAL LADDER



Famous CROWS'NEST Extension Ladders are world-renowned for their versatility, safety, dependability and ruggedness.

CROWS'NEST features are both numerous and important. They include the following:
- Safe, firm, sure-footed collapsible platform which drops into place when ladder is extended, folds when retracted.
- Elevations to 80'—inclinations to 72°—full rotational sweep of 360°.
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- No side-sway—no weave—no sag. Crow'snest ladders are strongly reinforced with steel trussing and rung ferrule braces. Structural steel gives ladder mount superior strength.
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Write now for illustrated literature or submit specifications for proposal. Address Dept. J.

ISC
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MATAWAN, NEW JERSEY

MEASUREMENTS . . . of insulation resistance, with the Vibrotest, used for testing motors, generators, transformers and other types of electrical devices. Step-by-step procedures of maintenance testing outlined. Chart for keeping records illustrated. Manual, P 14556, "Insulation Resistance Measurements," 32 pages. Associated Research, Inc, 3777 West Belmont Ave, Chicago 18, Ill. **(60)**

BRUSH MAINTENANCE . . . for low-voltage generators. Describes metal-graphite brushes, their composition for this application, and use. Selection table. Booklet, 16 pages. National Carbon Co, 30 E 42 St, NYC 17. **(61)**

MOTORS

MOTORS . . . heavy-duty, synchronous, 60-hp and up, at speeds from 500 to 1800 rpm. Suitable for standard voltage connection (60 or 50 cycle) built in a variety of enclosures. Leaflet 1100-PRD-252, 2 pages. Electric Machinery Mfg Co, Minneapolis 13, Minn. **(62)**

GEAR MOTORS . . . with Slo-Speed drives and Slo-Speed separate motor reducers. Basic types and modifications described. Bulletin 198, 8 pages. Sterling Electric Motors, Inc, 5401 Telegraph Rd, Los Angeles 22, Calif. **(63)**

SQUIRREL-CAGE MOTORS . . . 1 hp and larger, 3500 or 1750 rpm, in compact NEMA frame sizes 182-445U. Totally-enclosed, polyphase, squirrel-cage, with NEMA "C" faceplates for close-coupled centrifugal pump applications. "Prime Partners," four-page folder. Wagner Electric Corp, St. Louis 33, Mo. **(64)**

PROTECTION

CIRCUIT BREAKERS . . . Type TE (symmetrical terminal), TEF and TJL molded case. Data on selection, application, ordering. Illustrations and outline drawings. Bulletin GEA-7070, 6 pages. General Electric Co, Distribution Unit, 90 Whiting St, Plainville, Conn. **(65)**

PROTECTIVE RELAYS . . . complete line, with descriptions of each type, information on applica-

(Continued on page 144)

Haley's
CEDAR POLES and
FIR CROSS ARMS

Lightweight!
Strong!
Clear!

Pentachlorophenol Treated—protected against decay, moisture and insect damage, and will give long service life. Thoroughly tested and approved by leading public utilities as standard construction.

- *Two strategically located yards*

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MEASURES DOWN TO *ONE* MICROHM!
J. W. DICE CO. ENGLEWOOD, N. J.

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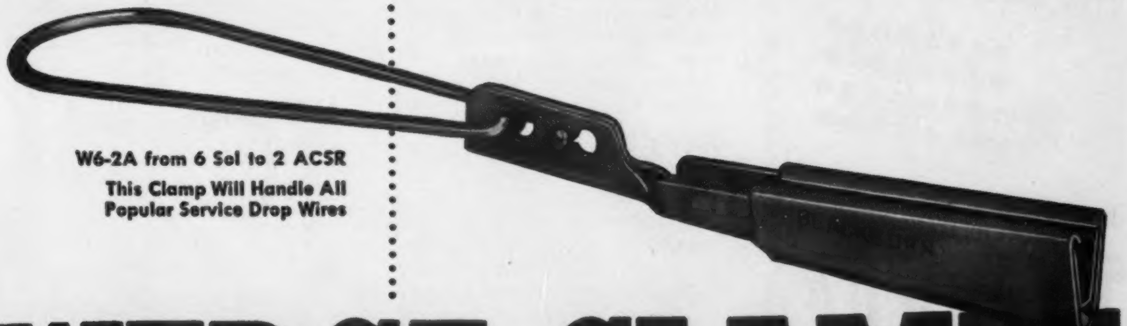
BLACKBURN



W6-2A from 6 Sol to 2 ACSR

This Clamp Will Handle All Popular Service Drop Wires

WEDGE CLAMPS

For Light Service
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6 Sol to 4 ACSR

For Heavy Service
W2-OA
2 Sol to 1/0 ACSR

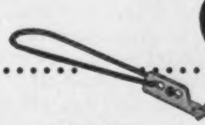
Conductor in contact with wedge for entire length of slider.

Removable aluminum slider allows installation without threading through clamp.

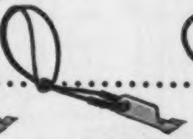
Drop wire can be pre-sagged and cut to exact length needed.

Can be attached to bare neutral at any point in the span.

Your Choice of 3 Bails



STANDARD



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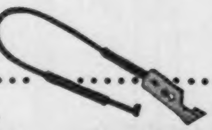

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CIRCLE 143 ON READER SERVICE CARD

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the MODERN way

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TAPERED STEEL LIGHTING TUBES

For
- Baseball Diamonds
- Football Fields
- Playgrounds
- Shopping Centers
- Truck Terminals
- Railroad Yards
- Race Tracks
- Radio and TV Towers
- Transmission Power Lines

Engineered for Permanence, Strength and Safety...
Designed to accommodate from 2 to 40 lights.
Streamlined to enhance the appearance of any lighted area.

MEYER MACHINE, INC.
RED WING, MINNESOTA

Relays

(*Continued from page* 142)

tions, special features, and design. Also general discussion on design of relays featuring induction movements, two types of hinged armature movements available, and operation indicators. Bulletin 6200, 6 pages. Federal Pacific Co, Fifty Ave L, Newark, N. J. **(66)**

FUSE CUTOUTS . . . Type LMO, open, 100-amp at 7.8, 15, and 27-kv with maximum interrupting capacities of 20,000, 16,000 and 6,000 amp, respectively. Application data, dimensional and ordering information, outstanding features. Bulletin FC3, 8 pages. Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis. **(67)**

TEST UNITS . . . portable, for protective relays. Standard ratings of 0.4, 1 and 2 kva. Gives general considerations on relay testing, description of circuitry of newly designed JR and SR series of relay units, special test units and auxiliary devices. Specific requirements met for units and related equipment from 1 kva to 500 kva. Booklet SB-RT-1, 48 pages. Multi-Amp Div, Multi-Amp Electronic Corp, 465 Lehigh Ave, Union, N. J. **(68)**

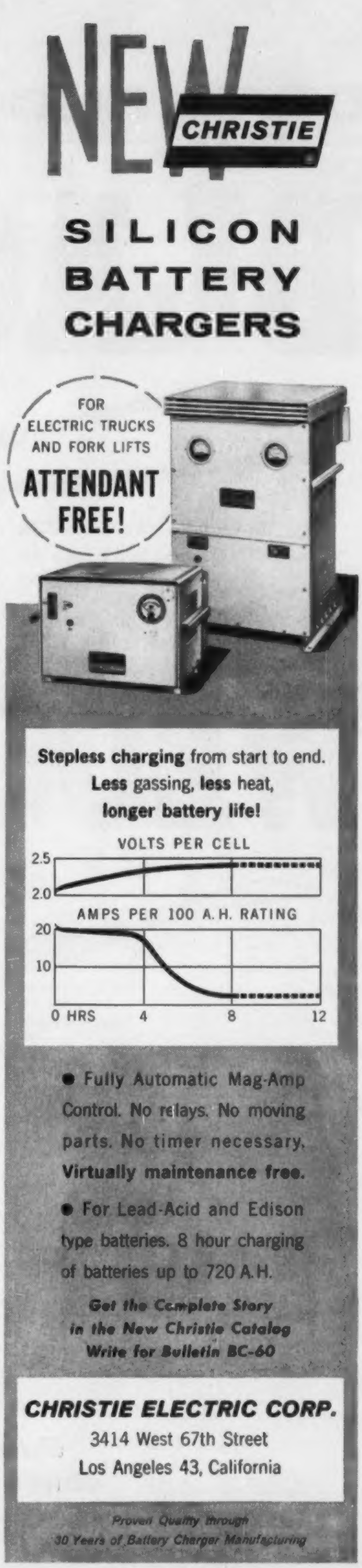
SWITCHGEAR

TRANSMISSION EQUIPMENT . . . current price digest, divided into 25 separate sales classes of heavy-duty electrical equipment for commercial, industrial, residential, and governmental installations. Additional sections devoted to parts and components, electrical control data with motor current ratings. Catalog, indexed, 300 pages. Continental Electric Equipment Co, Dept CAT, 205 W Fourth St, Cincinnati, O. **(69)**

SWITCH CUBICLES . . . high-voltage, Type Q. Cubicles supplied to specifications to house Type LBS, frame-mounted, manually-operated load-break switch. Schematic drawings. Bulletin 18X 9442, 12 pages, foldout note sheet. Allis-Chalmers Mfg Co, Milwaukee 1, Wis. **(70)**

AUTOMATIC RECLOSERS . . . Type HR for overcurrent protection on suburban and rural distribution systems. Photos, cutaway

(*Continued on page* 146)



NEW CHRISTIE
SILICON BATTERY CHARGERS

FOR ELECTRIC TRUCKS AND FORK LIFTS
ATTENDANT FREE!

Stepless charging from start to end.
Less gassing, **less** heat,
longer battery life!

- Fully Automatic Mag-Amp Control. No relays. No moving parts. No timer necessary. **Virtually maintenance free.**
- For Lead-Acid and Edison type batteries. 8 hour charging of batteries up to 720 A.H.

Get the Complete Story in the New Christie Catalog Write for Bulletin BC-60

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3414 West 67th Street
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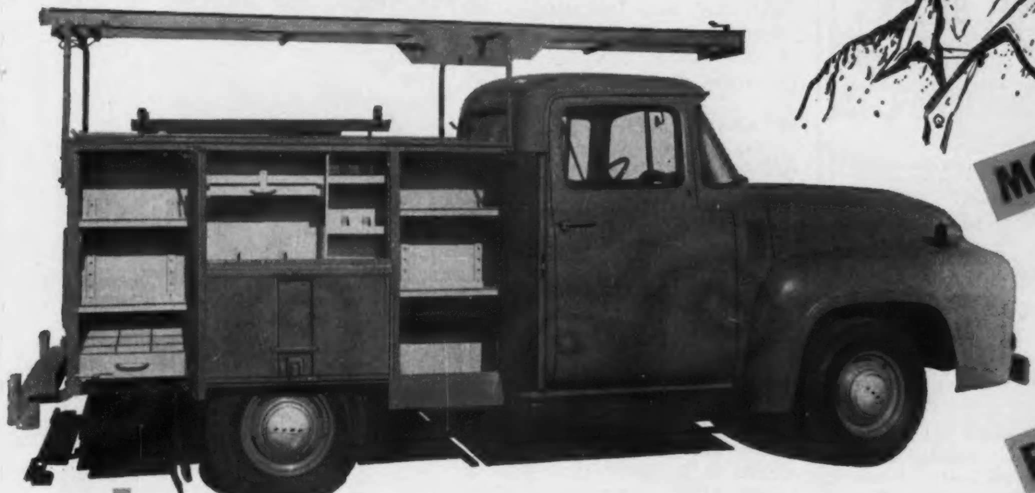
Proven Quality through 30 Years of Battery Charger Manufacturing

public utility men prefer—

YORK-HOOVER

YMR-76 Service Bodies



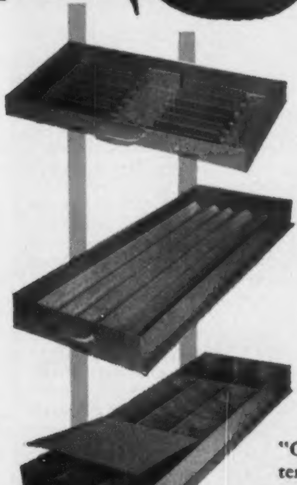
MODERN

PROVEN

EFFICIENT

LESS SERVICE HOURS...

plus extra savings in operators time are the results obtained by hundreds of YMR-76 Service Bodies in operation today. That's because YMR-76 units are compact and rugged . . . provide ample and convenient carrying space for materials and tools . . . with capacity for adjustment to meet changing conditions. Write for complete details, price and delivery information today!



"Custom" features such as material drawers with adjustable compartments are available as standard or optional equipment, as required.

BODY DIVISION
YORK-HOOVER CORPORATION
YORK, PENNSYLVANIA

CLIP AND MAIL TODAY!

Dept. 1E, York-Hoover Corporation
York, Penna.

Please send me a copy of Bulletin No. 942 covering your YMR-76 Service Body.

Name____________________

Company____________________

Address____________________

City and State____________________

CIRCLE 145 ON READER SERVICE CARD

CREATIVE ENGINEERING FOR THE PUBLIC UTILITY INDUSTRY SINCE 1892

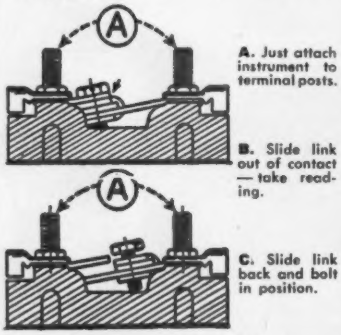
CHECKING A CIRCUIT WITHOUT DISTURBING PERMANENT WIRING IS EASY . . .

. . . IF YOU USE

THE STATES COMPANY

Sliding Link
NT TERMINAL BLOCKS

States exclusive sliding link feature permits checking circuit at any time without disturbing permanent wiring. It's as easy as A, B, C.



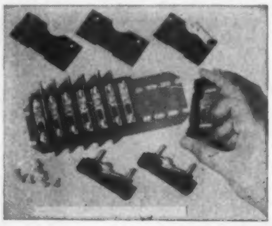
A. Just attach instrument to terminal posts.

B. Slide link out of contact—take reading.

C. Slide link back and bolt in position.

All testing done without touching permanent wiring. Built in any number of poles desired, front or back connected, with or without coding strip, with or without cover.

Here's how one prominent utility uses STATES NT BLOCKS for panel circuits. Note incoming leads to terminal block from floor.



Above shows how individual units are mounted on metal strips cut from 65 poles lengths. Thus "NT" Blocks may be obtained complete, or as parts to be assembled to fit any given installation.

Send for Cat. No. 1, Sec. 6

THE STATES COMPANY

19 New Park Avenue • Hartford, Conn.

CIRCLE 146 ON READER SERVICE CARD

Reclosers

(*Continued from page* 146)

drawing, basic application diagram, typical operation oscillogram and charts showing operation and time-current clearing curves. Bulletin GEA-7023, 8 pages. General Electric Co, Schenectady 5, N. Y. **(71)**

TRANSFORMERS

DISTRIBUTION TRANSFORMERS . . . pole-type, askarel or oil-immersed. New line with 12 design features illustrated Brochure, 4 pages. R. E. Uptegraff Mfg Co, Scottdale, Pa. **(72)**

TRANSFORMERS . . . through 10,000-kva, 69-kv, for nearly every type of service. Describes principal types. Brochure 132, 4 pages. Niagara Transformer Corp, Box 23, Buffalo 25, N. Y. **(73)**

MEDIUM TRANSFORMERS . . . with RM-ASA ratings of 501-5,000-kva, single-phase; 501-10,000-kva, three-phase, 69 kv and below. Also RM Pyranol and RM-LTC transformers. Construction details, accessories, features, ratings given. Performance data and dimensions for all types. Bulletin GEA 6108C, 32 pages, revised. General Electric Co, Schenectady 5, N. Y. **(74)**

WIRE & CABLE

ALUMINUM CONDUCTORS . . . resistance and reactance of aluminum conductors for overhead transmission lines. Includes latest findings on current technical research project. Information in tabular data and curves supported by detailed examples. Booklet, "Resistance and Reactance of Aluminum Conductors," 90 pages. Aluminum Co of America, 1501 Alcoa Bldg, Pittsburgh 19, Pa. **(75)**

DEAD ENDS . . . for down guying, Guy-Grip. Illustrations of procedures used in single guying, multiple guying to a single anchor rod, and multiple guying. Comparison of new cabled loop with open-helix loop Guy-Grip dead-ends presents specification and performance data. "The Good Guy," No. 37-300, 32 pages. Preformed Line Products Co, Dept GG-7, 5349 St. Clair Ave, Cleveland 3, Ohio. **(76)**

Crapo

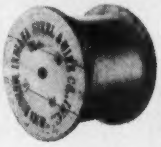
GALVANIZED STEEL STRAND HAS ALL 5

1. *Strength*
2. *Workability*
3. *Ruggedness*
4. *Long Life*
5. *Economy*

When you select a size and grade of strand for a specific job you want to know that it meets every requirement of that job. You want ample strength to sustain the ultimate load—plus an adequate safety factor. You want pliability for ease of working in the field. You want ruggedness to withstand the abuse which may be encountered during and after installation. You want long, dependable life. And, you want reasonably low first cost and low maintenance costs.

For more than 50 years *Crapo* Galvanized Steel Strand has consistently demonstrated its ability to more than meet all of these requirements. Proof of its reliable performance is to be found in the case histories of overhead power and communication lines throughout the country.

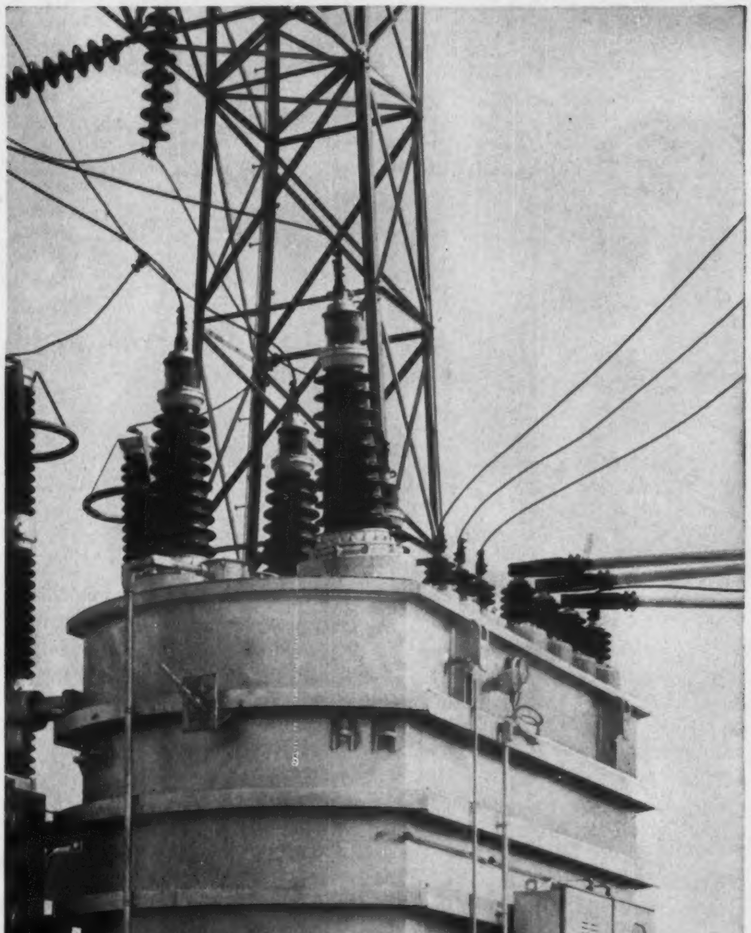
Crapo Galvanized Steel Strand is fully protected against corrosion by heavy, uniform, dense coatings of commercially pure zinc tightly bonded to the individual wires. All grades and sizes are available in A, B and C weights of coating.



For details, ask our distributor or write direct!

INDIANA
STEEL & WIRE
COMPANY, INC.
Muncie, Indiana

CIRCLE 172 ON READER SERVICE CARD



Installation view of a high efficiency 53,333 kva power transformer

UNIVOLT® 35 TRANSFORMER OIL

High Oxidation Stability... Low Power Factor

Univolt 35 is an outstanding transformer oil because of its excellent oxidation stability, low power factor and lasting insulation action. This dependable, proved-in-use product is refined from a high quality, specially selected straight mineral oil. Its highly desirable characteristics include low viscosity, freedom from acid, alkali and corrosive sulfur, and compatibility with the varnish finishes of coils.

Univolt 35 offers outstanding performance under the conditions of extreme heat produced by peak summer loads serving commercial and home air conditioning. The utmost care is taken in transporting Univolt 35: it is shipped in specially prepared and inspected tank cars which are loaded indoors.

Univolt N36 is another high quality transformer oil. Perfected by Esso Research, it possesses all the characteristics of Univolt 35 plus an effective oxidation inhibitor. For complete information write: Esso Standard, Division of Humble Oil & Refining Company, 15 West 51st Street, New York 19, New York.

Esso

In Industry after Industry..."ESSO RESEARCH works wonders with oil"

CIRCLE 147 ON READER SERVICE CARD

Cut Cost Of Reclaiming Insulators and Hardware

DIRTY INSULATORS are washed, packed and palletized by two men at a rate of 2,000 units per working day

R. R. MURDOCK, General Supt, General Stores Dept, Duquesne Light Co, Pittsburgh, Pa.

Reclamation of insulators and pole line hardware has been put on a more efficient basis in the Substations Maintenance Shop of Duquesne Light Co. Through the use of a washing machine and deep wire baskets, the overall cost of reclaiming 2.3-kv pin-type insulators has been reduced about 50%. A program of recoating line hardware increased the hardware salvage about 33% the first year and an additional 53% the second year.

Insulators reclaimed in the shop formerly were cleaned by hand with cleaning fluid and packed in new cardboard boxes. With this type of handling, the cost of salvage was high, breakage was considerable, and operators were subject to the hazards of working with a hot, corrosive cleaning fluid.

The present method was established following the purchase of a Magnus AJA LIF washing machine and a number of 20x38x24-in. wire baskets for storing and transporting insulators. Using this automatic machine along with pneumatic elevators and roller conveyors, two men can wash, pack and palletize more than 2,000 insulators per working day. The overall cost of reclaiming a 2.3-kv pin-type insulator has thus been reduced from 7.5¢ to 3.8¢ each. In addition, breakage has been cut greatly and the hazard of using cleaning fluid largely reduced.

WIDE-BASE PINS are metal-sprayed and phenolic-sealed. Lead threads are protected by cardboard cover

This cost is largely incremental in that insulators now are accumulated and an outside group cleans them during slack periods or inclement weather. The minimum quantity of insulators to be reclaimed, stored of transferred to a district warehouse is one basket load. In the case of 2.3-kv pin-type units, this represents 300 insulators.

The program of reclaiming hardware items, such as transformer hangers, secondary racks, and 48-in. angle braces, has been increased wherever it could be economically justified. Any of the above items, which are severely rusted but not pitted, can be cleaned and regalvanized at a cost of 6¢ per lb. This part of the program, started in 1957, increased the hardware salvage from $58,000 in 1956 to $77,000 in 1957.

Other hardware items, such as drop-forged clamp pins or wide base clamp pins, could not be regalvanized economically. A study of the problem of resurfacing such lead threaded items showed that they could be rehabilitated economically by having them cleaned and metal-sprayed with aluminum or zinc. Accelerated salt-water tests indicated that the zinc metallizing process followed by a dip in a phenolic sealer is the most satisfactory.

Reclaming cost, including extra sorting and handling for the zinc spray method, represents about 20% of the purchase price of a "new" item. This part of the program started June 1, 1958, and salvable items were saved for months in anticipation of approval. The value of hardware salvaged in 1958 showed a 53% increase over 1957. The value of of hardware salvaged during 1959 was about $110,000 for a total of $305,000 for the three years compared with $58,000 salvaged in 1956.

(More Stores & Shops on page 150)

CIRCLE 148 ON READER SERVICE CARD

NECCOBOND...another forward step in uprating generator capacity

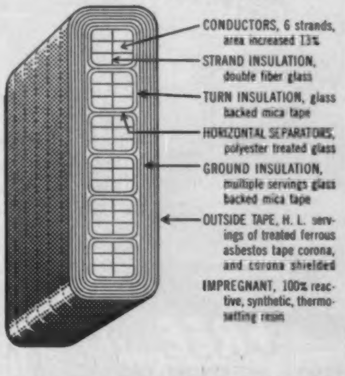
This 18,750 KVA, 6600 volt, 112.5 rpm, 3 phase waterwheel generator was recently rewound—and uprated – because NECCOBOND insulation system has inherently better thermal conductivity, higher operating temperature properties and permits better utilization of slot space.

National redesigned and manufactured the coils to take advantage of the NECCOBOND system—using mica and glass, impregnated with a special 100% reactive resin into a solid, voidless insulation wall.

Results – the rewound generator can be uprated in capacity without increasing the stator temperature rise. Coils fit perfectly, and did not have to be heated for installation, and no dry-out was required.

For top performance in electric coils or repair service call National.

NECCOBOND CONSTRUCTION


CONDUCTORS, 6 strands, area increased 13%
STRAND INSULATION, double fiber glass
TURN INSULATION, glass backed mica tape
HORIZONTAL SEPARATORS, polyester treated glass
GROUND INSULATION, multiple servings glass backed mica tape
OUTSIDE TAPE, H. L. servings of treated ferrous asbestos tape corona, and corona shielded
IMPREGNANT, 100% reactive, synthetic, thermosetting resin

NATIONAL COILS

National Electric Coil

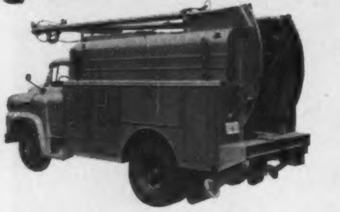
DIVISION OF McGRAW-EDISON COMPANY • COLUMBUS 16, OHIO

Electrical Engineers • Manufacturers of Electrical Coils, Insulation, Lifting Magnets
Redesigning and Repairing of Rotating Electrical Machines

McGRAW EDISON

CIRCLE 149 ON READER SERVICE CARD

Koenig ALL-STEEL UTILITY BODIES



LINE-CONSTRUCTION BODY
. . . available in 9' to 14'6" lengths with mechanical or hydraulic winch and derrick, or any other special or custom equipment desired. Compartments can be arranged to your specifications.

SERVICE BODIES
. . . for ½-, ¾-, and 1-ton chassis. Electrically welded into one unit with six waterproof compartments, recessed paddle handles keyed alike and fender skirt protected with die-formed rolled edges. Built for safe, dependable service . . . will outlast several chassis.

3-WAY DUMP BODIES
DUMP to the RIGHT, LEFT and REAR
All-steel welded bodies available in 8' to 11' lengths. The multistage telescopic hoist has a lifting capacity of 25,000 lbs. This is the ideal body for safe dumping under hazardous conditions . . . especially adaptable for windrowing and backfilling.

YOU CAN BE SURE OF QUALITY MATERIALS AND WORKMANSHIP WHEN YOU SPECIFY KOENIG PRODUCTS

Write today for literature, specific information and name of nearest distributor.

Koenig IRON WORKS, Inc.
P. O. BOX 7726C
HOUSTON, TEXAS

CIRCLE 173 ON READER SERVICE CARD

It took 29 yrs. research to make

JAQUES hydraulic HOLE DIGGERS
Fastest, Strongest, Safest most economical!

Jaques' TJ-254 digging at 30-degree angle. Operates at up to 45 degrees.

Time-and-money-saving features of Jaques All-Hydraulic Hole Diggers took 29 years to develop. Rugged, versatile Jaques TJ-254 mounts on standard trucks, drills holes up to 48" diameter, to 25' depth, in hardest soil or rock— FASTER, CHEAPER, EASIER than competitive machines! Fewer moving parts insures ***minimum downtime, maintenance, operating costs.*** Shock-resistant device relieves strain in rock digging. Simple to operate with only 3 primary adjustments. FREE DEMONSTRATION WILL PROVE THESE CLAIMS!!

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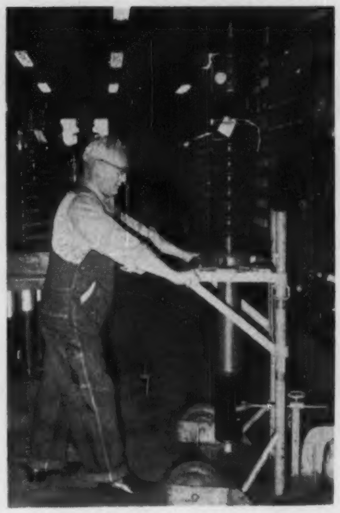

Cart and Rack Simplify

Special racks and a special cart simplify the handling of bushings in the shops of Oklahoma Gas & Electric Co. The special devices make it easy to move bushings to and from storage racks, to the area for bushing repair, or to trucks.

Bushings are stored in racks made of steel channels, angles and pipe. Key to their convenience are the two channels on which the bushings rest. Channels are mounted on 3-in. steel pipe uprights with the backs of the channels up. They are spaced so that bushing stems slip between them easily. The mounting flanges of the bushings rest securely on the channels. Pipe uprights are welded at the top to the channels; at the bottom to a steel base made of angles

Handling of Bushings

and plates welded together.

Bushings are moved into and out of the storage racks with a one-ton crane. The special cart is used to move bushings around the shop. The cart is adjustable to take different bushing sizes. A steel collar on the cart, on which the bushing rests, is split so that one half hinges open. This facilitates putting a bushing on the cart or taking it off.

With a bushing on the cart, the collar is closed and locked to hold the bushing securely. An adjustable guide can be placed against the lower part of the bushing stem to stabilize it while the cart is in motion. The cart, built in OG&E's shop, is mounted on three rubber-tired wheels so that it can be pushed easily by one man.

Electric Heaters Serve Dual Purpose

Crews were quick to make use of electric heaters installed near the storeroom counters in Oklahoma Gas & Electric Co's service center. Heaters serve to warm air coming into the storeroom. While men wait for material orders to be filled, they dry and warm their footgear on the heaters.

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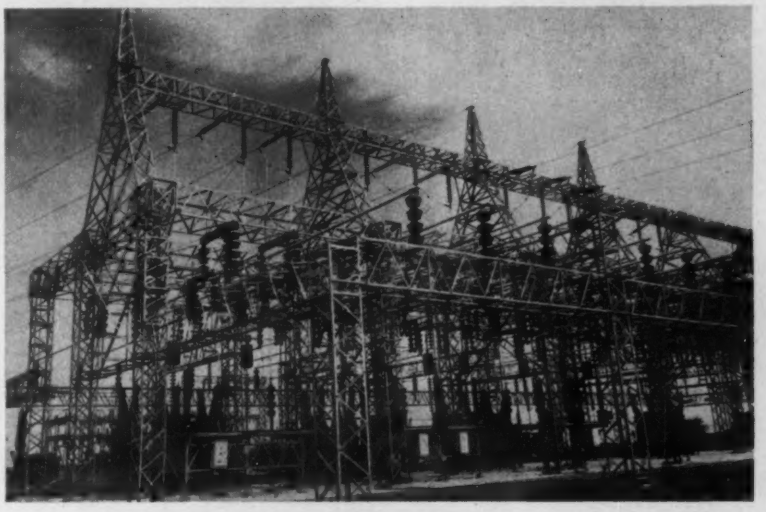

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Cable Splicing Vans

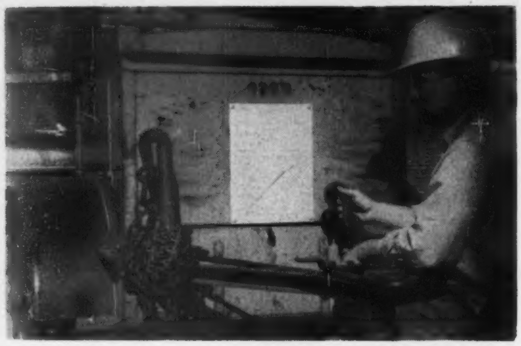
Line Trucks

Safe Practice Bulletins Stay Clean and Permanent

***T. E. DAVIS,** Supervisor of Safety, Electric Distribution Dept, Cincinnati Gas & Electric Co, Cincinnati, Ohio*

Safe practice bulletins, placed on all overhead and underground equipment and bulletin boards of the Electric Distribution Dept, have acquired a new permanency and are easier to keep clean and readable. Formerly the bulletins were printed sheets inserted in isinglass folders which soon became soiled and worn. The folders in this condition often wound up in some remote corner.

The new bulletins are made of durable porcelain, about 10 x 15 in. in size. They are permanently fastened to doors, bulletin boards or other hard surfaces. With an occasional wiping with a damp cloth, they remain neat, clean and readable.



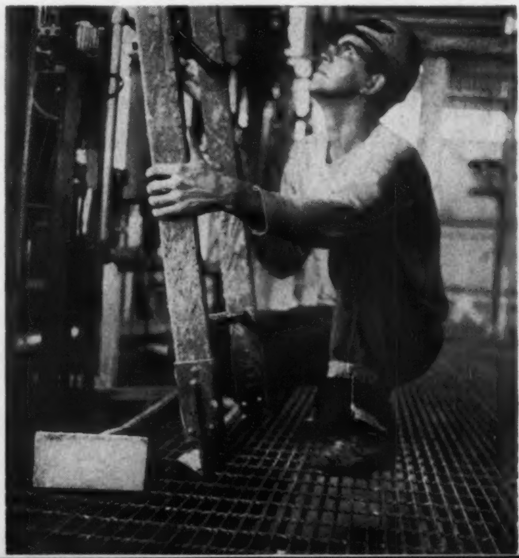
District Tool Carts

Prong Holds Ladder Firmly

An attachment, called a safety foot, will keep a ladder firmly in place when used on an expanded-metal floor grating. The attachment is a steel plate, wrapped around the foot of the ladder. An iron prong projects from the plate, runs through the floor-grating, and keeps the ladder from slipping.

The plate is ⅛-in. steel, 5 x 6 in., formed to fit around the ladder leg and bolted to it with three ⅜x2½-in. machine bolts with flat washers. The prong is a 7-in. piece of ½-in. black-iron rod, 4 in. of which is welded onto the plate. Cost of the attachment was $2 for material and $3.75 for labor. The Atlanta plant of Owens-Illinois has equipped four ladders with safety feet.

(More Safety on page 154)



Gaffs and leg irons are forged high quality, medium carbon steel, heat treated to assure proper balance of hardness, toughness, ductility.

MSA®-Brooks Adjustable Hooks*–designed by a lineman for linemen

A climber's first consideration in a pair of hooks is just how safely, how comfortably do they anchor his feet in the pole. M-S-A–Brooks adjustable linemen's climbers give him the security he's looking for. And a lot more to boot.

Here's why. First off, these are the only climbers made with a tang extending from the gaff. This tang curves under the foot and for safety's sake fastens positively at both sides of the foot. No amount of climbing will work the gaffs loose from the leg iron. But *a man can unfasten them in a jiffy* for maintenance or replacement in the field.

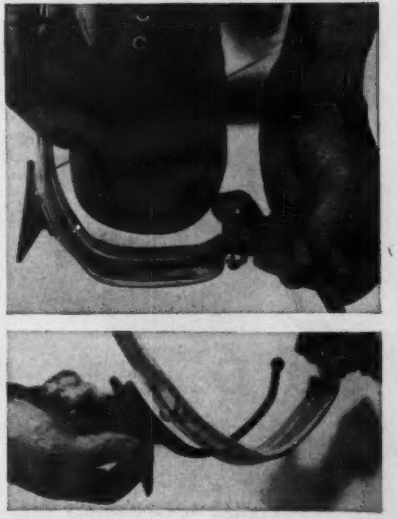
The shape and angle of these gaffs are also important. They prevent dangerous cut-outs—let a man climb without bowing his legs excessively. Moreover, both gaff and tang are forged in one continuous piece for *real* safety.

High quality medium carbon steel—specially selected because of its exceptional strength—enables these hooks to absorb plenty of punishment year in, year out. Exacting craftsmanship shapes the quality materials. Then there's austempering. Rockwell Hardness Tests. Rigid Magnaglo inspection process. And impact tests.

Comfort aspects receive their share of attention too. Leather pads and straps are safe, supple top grain steerhide. Reinforced chrome leather pads on the leg iron assure additional climbing comfort.

The MSA man has the entire story. Ask him for details. Or write us for helpful literature.

*Meets E.E.I. specifications.



Gaff and tang fit through slot in leg iron, are seated in channel of stirrup and locked in on both sides of the foot for utmost safety.

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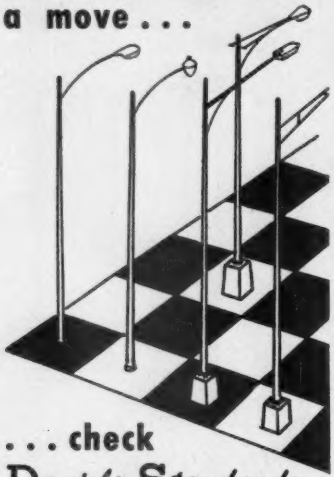

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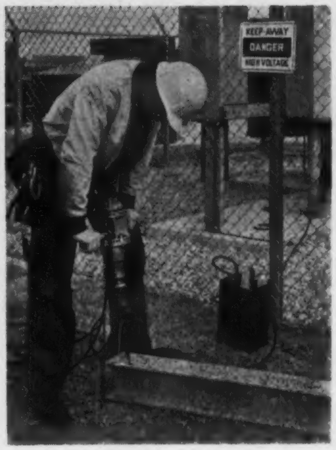
Protect Workman Against Gradient

Isolating transformers are used by Oklahoma Gas & Electric Co to protect a workman from a dangerous potential gradient when using portable electric tools near substations. The transformers, insulated for 5 kv, eliminate the hazards involved in plugging portable tools into outlets in the substation area and taking the tools outside the substation's grounding grid for work.



A convenient plug-in arrangement was made in the shop to make the isolating transformers easy to handle and to use. Two three-prong outlets make it easy to plug in the cord from the substation outlets and the cord from the portable tool. The case has a convenient handle for carrying.

Detect Hot Wires in Flooded Areas

A successfully-tested Australian-designed device detects live electrical conductors from a distance and removes one of the dangers of rescue work in flooded areas. The detector was developed by J. Dembecki, New South Wales Electricity Commission, Sydney, Australia.

It differs from similar equipment in operation because it features small size and special adaption for flood rescue work. In addition, it has a very good range of operation (over 400 yd for a 132-kv transmission line) and does not need to be operated by a skilled person.

The transistorized unit operates from a 4.5-v battery. It is sensitive to power and lower radio frequencies but will not pick up the upper radio or television frequencies.

Cut Handle to Save Dropping Hammer

***ASA C. RANDALL**, Clerk, Green Mountain Power Corp, Montpelier, Vt.*

A lineman's hammer will slip easier into his belt and prevent the possibility of its being dropped if the handle is cut at an angle. This is a little trick that some of the older linemen of Green Mountain Power Corp use to aid in replacing their hammers in their belts.

With the handle cut at an angle, a lineman can re-insert the hammer even into the belt loop at his back without twisting or turning. This reduces the danger of coming into contact with live wires when on a pole. Cutting the handle in this fashion does not change the balance of the hammer to any extent.

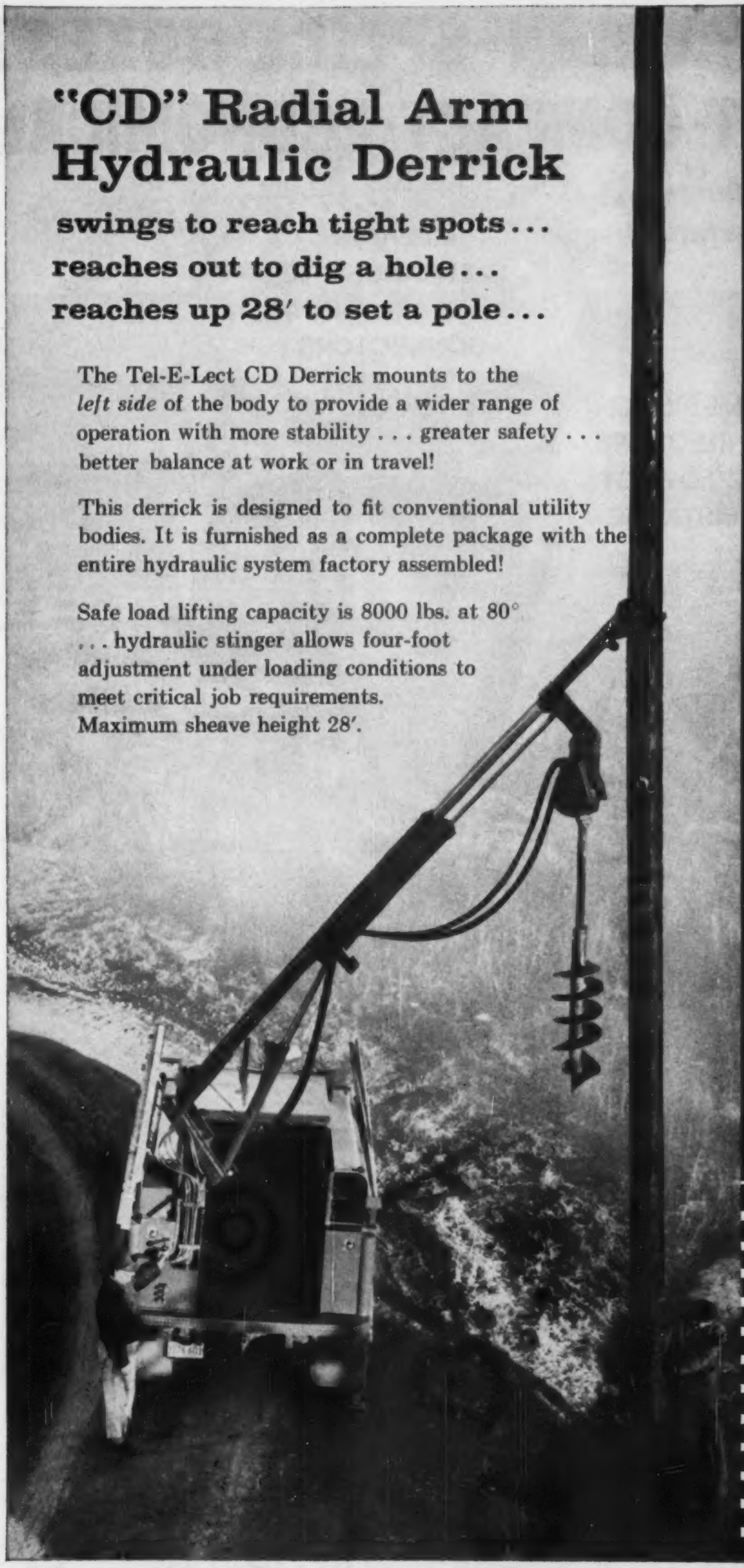
"CD" Radial Arm Hydraulic Derrick

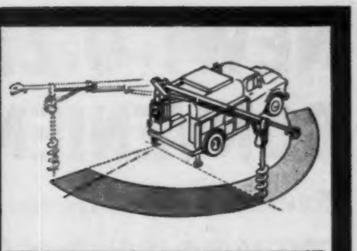
swings to reach tight spots...
reaches out to dig a hole...
reaches up 28′ to set a pole...

The Tel-E-Lect CD Derrick mounts to the *left side* of the body to provide a wider range of operation with more stability . . . greater safety . . . better balance at work or in travel!

This derrick is designed to fit conventional utility bodies. It is furnished as a complete package with the entire hydraulic system factory assembled!

Safe load lifting capacity is 8000 lbs. at 80° . . . hydraulic stinger allows four-foot adjustment under loading conditions to meet critical job requirements. Maximum sheave height 28′.





FULL DERRICK RANGE . . . no need to position truck precisely for digging. Just pull up near pole location and let the Tel-E-Lect CD and digger reach out . . . in . . . or around to dig the hole exactly where you want it! Same feature makes pole setting . . . all derrick work easier!

LOADS INTO BODY . . . highly maneuverable CD Derrick lifts full capacity loads directly into truck body. Does it more safely, too, thanks to minute adjustments up, down or around now possible. Ideal for a combination yard and road truck.

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Today, return coupon and get complete information on new, low cost CD Radial Arm Derrick!

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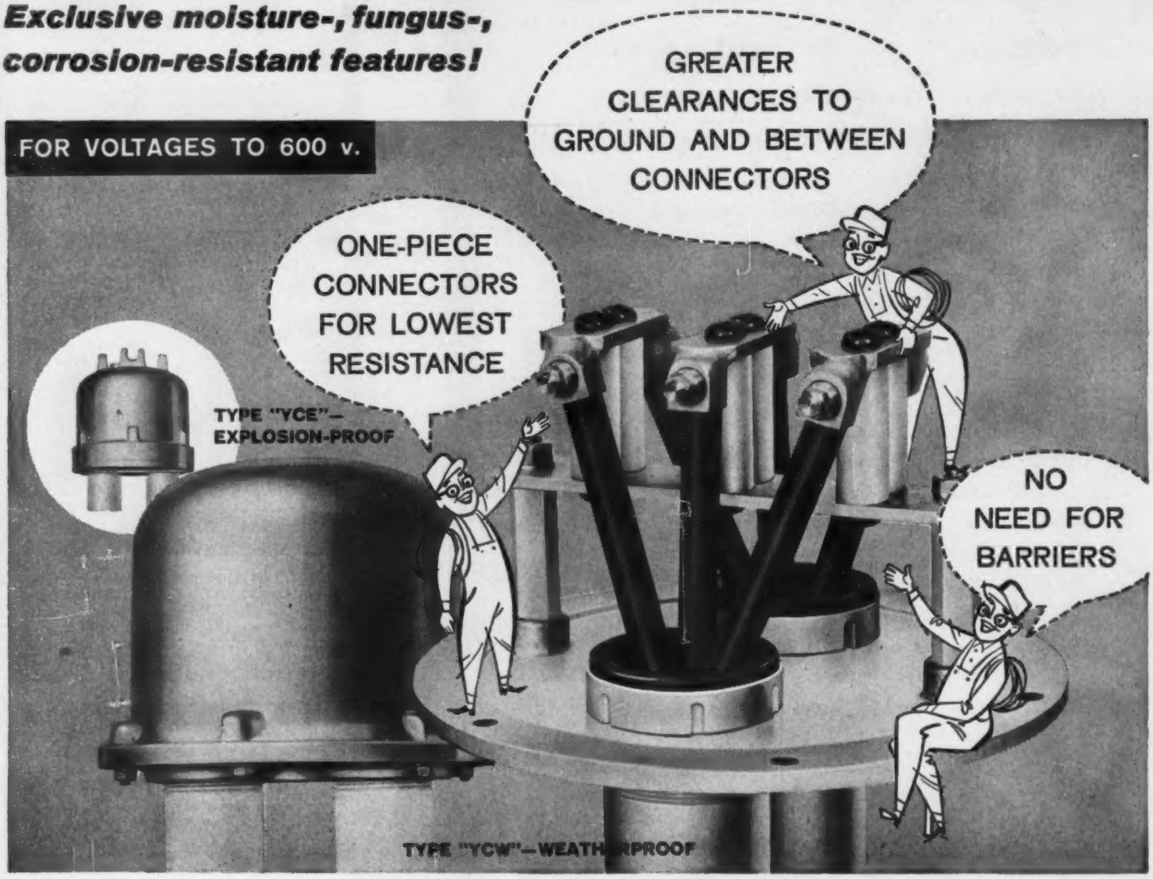
Exclusive moisture-, fungus-, corrosion-resistant features!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GREATER CLEARANCES TO GROUND AND BETWEEN CONNECTORS
ONE-PIECE CONNECTORS FOR LOWEST RESISTANCE
TYPE "YCE"—EXPLOSION-PROOF
NO NEED FOR BARRIERS
TYPE "YCW"—WEATHERPROOF

O.Z. Pull-n-Splice Boxes mark a significant advance in pull box construction!

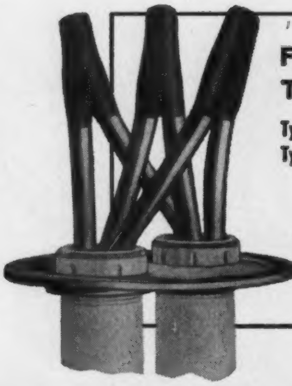
Their highly compact size saves *more space than ever!*

Their more efficient design means *new savings in installation time and labor!*

Their moisture-, fungus-, and corrosion-resistant features mean long, trouble-free service.

Still, with all their features, the new O.Z. Pull-n-Splice Boxes are *smaller* — and *cost far less* than conventional pull boxes . . . even late model *competitive* types! And, you get a bonus in high quality materials and workmanship so characteristic of *all* O.Z. products!

For complete information on these and the many other O.Z. products that mean more for you, call your local O.Z. distributor, or write to the company.



FOR VOLTAGES TO 5000 v.

Type "YPW" — Weatherproof
Type "YPE" — Explosion-proof

Deeper dome than "YCW" and "YCE". Furnished without connector panels. Insulated pigtail splices recommended.

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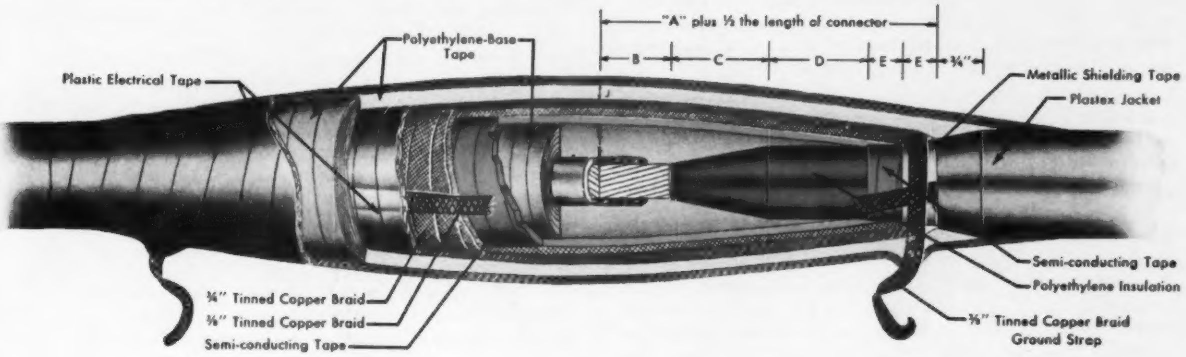
FORM NO. 1102

Instructions for Splicing

Single Conductor, Polyethylene Insulated, Shielded, PLASTEX Jacketed Cable


"A" plus ½ the length of connector
B
C
D
E
E
¾"
T
J
Polyethylene-Base Tape
Plastic Electrical Tape
Metallic Shielding Tape
Plastex Jacket
Semi-conducting Tape
Polyethylene Insulation
⅜" Tinned Copper Braid Ground Strap
¾" Tinned Copper Braid
⅜" Tinned Copper Braid
Semi-conducting Tape

T — 1½ times the factory-applied insulation thickness

J — 1½ times the factory-applied jacket thickness

Rated Circuit Voltage Phase to Phase (Grd. or Ungrd.)	DIMENSIONS IN INCHES				
	A*	B	C	D	E
2001 — 4000	4¼	½ length of splicing sleeve plus ½"	¾	2	½
4001 — 7000	5		1	2½	½
7001 — 10000	5¾		1¼	3	½
10001 — 13000	6		1½	3	½
13001 — 14000	6¼		1¾	3	½
14001 — 15000	6½		2	3	½
15001 — 17000	7¼		2¼	3½	½
17001 — 20000	8½		2½	3¾	¾
20001 — 23000	9		2¾	4	¾
23001 — 27000	10		3¼	4½	¾
27001 — 30000	11¼		3¾	5¼	¾
30001 — 35000	12¼		4¾	5¼	¾

*To the dimension listed under "A" add one-half the length of the connector.

a. Train the cables into position and cut them off squarely so that they butt.

b. Select dimension "A" opposite the proper phase-to-phase voltage; then remove the Plastex jacket from the ends to be spliced for a distance equal to dimension "A" plus one-half the connector length. *Do not make a ring cut in the jacket because of the danger of cutting the metallic shielding tape and insulation.*

c. Unwrap the metallic shielding tape and the semiconducting tape and cut each tape so that it extends beyond the preceding tape or jacket. *Be careful not to cut the conductor insulation.* The semiconducting tape may be bound in place with thread or fine string in order to prevent it from unraveling. The metallic shielding tape should be tacked in place with solder.

d. Remove the insulation from the end of each conductor for a distance (B) equal to one-half the length of the connector plus ½". *Be careful not to nick the conductor.*

e. Taper the insulation at each end smoothly for a distance equal to dimension "C".

Care must be taken to see that the taper is smooth so that no voids will remain after the joint is insulated. Sandpaper or a rasp may be used to buff the taper. *Emery paper should not be used for it contains metallic particles.*

f. Taper the jacket at each end smoothly for ¾". Sandpaper or a rasp may be used to buff the tapers.

g. Join the conductors with a compression type connector and fill the indentations with a suitable compound, such as lead wool, duct seal, etc., so the *connector will have a smooth outer surface.*

h. Scrape all the exposed insulation thoroughly with a knife and clean the surfaces by wiping them with a cloth *in order to remove any loose threads or conducting particles that may remain from the semiconducting tape.*

i. Apply polyethylene cement to the exposed insulation

Advertisement

CIRCLE 159 ON READER SERVICE CARD

and *allow it to dry. Do not apply polyethylene cement between the layers or over the polyethylene-base tape.*

j. Tape over the joint and all the exposed insulation with polyethylene tape, *being careful not to cover the semiconducting tape at each end.* Wrap the polyethylene-base tape ½ lap in successive layers until the thickness over the connector is equal to 1½ times the thickness of the factory-applied insulation. In wrapping the tape, stretch it until its width is approximately ½". Even tension should be used so that each layer is of uniform thickness and density. *Keep the tape free of dirt and moisture.*

In order to reduce the strains of stretching the tape and to prevent voids between layers of the tape, the insulated joint may be compressed by applying a highly elastic rubber tape over it. Two layers of the elastic tape should be tightly wrapped over the insulated joint with a ½ lap. It should be left on for *three minutes and then removed.*

k. Wrap a layer of semiconducting tape over the insulated joint with a ½ lap, overlapping the semiconducting tape at each end of the splice. *The semiconducting tape should be applied smoothly and be in intimate contact with the insulated joint.*

l. Wrap a layer of ¾" copper braid shielding tape over the semiconducting tape with a ¼ to ½ lap, overlapping the metallic shielding tape at each end of the splice. *The copper braid shielding tape should be in intimate contact with the semiconducting tape.* Experience has shown that the copper braid tape should be applied in two pieces. Each piece should be wrapped from the center toward an end. This allows the taping to be done in a "downhill" direction on each side of the joint. If this method is used, overlap the copper braid tape at the midpoint and solder them together. Solder both ends of the copper braid tape to the metallic shielding tape.

CAUTION — Polyethylene can be damaged by excessive heat, therefore, use extreme care in all soldering operations.

m. Lay a length of ⅜" copper braid tape horizontally across the splice, overlapping the metallic shielding tape on each end, and solder to the shielding tape and copper braid tape.

To ground the shield at the splice, solder a ground strap to the metallic shielding tape. *The ground strap must be thoroughly soldered and either be clamped or soldered to a good electrical ground.*

The metallic shielding tape must be grounded at each end on a long cable run and at one end on short runs. Where a cable is provided with a ground lead, attach it securely to a low resistance ground. Ground clamps may be used but they should provide good electrical contact.

n. Wrap one layer of Plastic Electrical Tape with a ½ lap over the copper braid shielding tape. *The plastic tape must not be stretched.* Tension should only be that required to lay the tape on smoothly so that no wrinkles remain. In cold weather, the tape should be warmed before applying.

o. Scrape each jacket taper and 2" behind its shoulder with a knife. Clean the surfaces by wiping them with a cloth.

p. Apply polyethylene cement to the cleansed sections and *allow it to dry. Do not apply polyethylene cement between the layers or over polyethylene-base tape.*

q. Tape over the cemented sections of the jacket and the Plastic Electrical Tape with polyethylene-base tape. Wrap the tape with a ½ lap in successive layers until the thickness over the joint is equal to 1½ times the thickness of the factory-applied jacket. In wrapping the tape, stretch it until its width is approximately ½". Seal the ground strap, extending from the splice, with a few layers of polyethylene-base tape.

r. Cover the entire splice with two layers of Plastic Electrical Tape applied with a ½ lap and extending 1" beyond the polyethylene-base tape at each end. Cover the polyethylene-base tape on the ground strap with two layers of Plastic Electrical Tape, allowing it to extend onto the strap.

Multi-Conductor Cable Splice

Each conductor of a multi-conductor cable is spliced in the same manner as the above single conductor cable, up through step "m." The outer jacket has to be removed a sufficient distance to allow ease in splicing. Where a cable binder tape and fillers are present, remove the cable tape to within ½" of the edge of the jacket and unlay the fillers. The splices in the individual conductors may be staggered in order to keep the diameter of the joint to a minimum. After splicing the individual conductors, replace the fillers and bind the conductors together with one layer of Plastic Electrical Tape, overlapping the ½" exposed cable binder tape. Proceed to tape the jacket in the same manner as for a single conductor cable.

Simplex Splicing Tape – To insure the best possible splice under all conditions, it is recommended that Simplex Splicing Tape be used. Ask your Simplex man about splicing tape for all applications.

Splicing is the purchaser's responsibility. The instructions should be read and carefully followed by the person or persons splicing the cable. Any troubles resulting from failure to follow these instructions are not the responsibility of the manufacturer.

Simplex

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Cambridge, Mass. • Newington, N. H.

Pre-planned surplus capacity . . .

Helps Add Commercial Cooking Load

S. G. KENT, Power Salesman, Florida Power & Light Co, Miami Beach, Fla.

Selling surplus electrical capacity to the St. Francis Hospital in Miami Beach at the time it installed central air conditioning in 1958 paved the way for Florida Power & Light to sell electric cooking later on.

When the hospital decided to install the central air conditioning it was faced with the problem of enlarging the transformer vault for additional transformer capacity to supply 120/240-v, four-wire, three-phase, delta distribution, and for an automatic throwover switch for two 13-kv underground feeders. The problem was there was no adjoining space for extending the vault.

So the hospital authorities were then sold on the proposition that if they would convert their distribution to 120/208 v, wye, four wire, three phase, the existing vault space would be sufficient for the three-phase transformer which was required, and for the automatic throwover switch to insure uninterrupted service.

Besides being the most economical solution to the immediate problem, the existing switchboard could be utilized to its full capacity so that considerable future load could be added.

This spare capacity came in quite handy when the hospital remodeled and expanded its food service facilities, and was sold on replacing its gas cooking equipment with 141.5 kw of electric cooking and baking equipment.

Demand Ratio Computed

A new 400-amp capacity feeder was installed between the switchboard and a panel in the new kitchen area. From a test meter with graphic demand, connected in this feeder, it was determined that the ratio of the 15-minute maximum cooking demand of 40 kw, to the connected cooking load of 141.5 kw, was 28.2%. The billing demand responsibility was 32 kw.

During a 31-day test period, 10,310 kwhr were used in preparation of 35,096 meals, or an average of .294 kwhr per meal.

The total maximum 15-minute demand of the 260 bed hospital for the test period ending January 11, 1960 was 259 kw, making the ratio of cooking demand to the total demand, 15.4%. During summertime, when air conditioning is in use, this ratio will be about 9%.

Included in the new cooking area are all-electric ranges, a griddle, broiler, roasting ovens, deep fat fryers, baking ovens, baker's ranges, and food and dish warmers.

According to Chef Andrew Lambert, "These electric cooking appliances beat anything we had before. They are more efficient, and cook cleaner and better."

While the baker, Mrs. Maurine Early, says, "I was apprehensive when we changed to the new electric ovens, because I have used other ovens for the past eight years. I did not think electricity would do the same job.

"However . . . I am proud to say that I would use nothing but electric ovens now. These new electric ovens never heat up the bakery, it stays a pleasant temperature in here all the time."

(*More Selling on page* 164)

Cable News from

IT'S WHAT'S OVER THE

A NEW INSULATION AND A

NEW GE NO. 1799 DG VARNISHED DACRON GLASS PROVIDES MAJOR INSULATION IMPROVEMENTS

The new GE No. 1799 DG varnished Dacron glass insulation offers these major improvement values in varnished cloth-insulated cables:

Longer Life

- Lower electrical losses
- Better heat and moisture resistance

Ease of Handling

- Smaller over-all diameter

Reduced Insulation Thickness

- Greater dielectric strength
- Greater mechanical strength

Greater Current-carrying Capacities

- 0 to 15 kv—85 C conductor temperature
- 23 kv—80 C conductor temperature

Excels in test comparisons

Test comparisons between varnished Dacron glass insulation and varnished cotton are shown in the table at right. Of particular importance to cable users are those results which show that GE No. 1799 DG varnished Dacron glass insulation:

... has almost 20% greater dielectric strength than varnished cotton in a dry condition, much greater dielectric strength in extreme humidity.

... changes dielectric strength relatively little when stretched and when ambient temperatures vary widely.

... has stable power factor at much lower values than varnished cotton.

Physical and Electrical Properties of Tapes

Typical Values	GE No. 1799 DG	VC
Tear Strength — Grams		
Lengthwise	Does not tear	208
Crosswise	708	270
Dielectric Strength — Volts Per Mil		
IPCEA Method—Room Temp	1420	1220†
(step by step) 85 C	1200	1065*
Short Time Method Dry —	1974	1574
96 hours in 96% humidity	1386	740
6% Elongation	1812	
12% Elongation	1755	
Per Cent Power Factor		
Temp 30 C	2.3	6.9
Temp 80 C	3.5	9.2
Temp 100 C	6.7	13.4
Per Cent Moisture Absorption 96 hours at 96% humidity	0.64	1.9
Per Cent Water Absorption 96 hours in water 25 C	0.82	5.7

†Industry standard—1000 v/mil
*Industry standard— 750 v/mil

... will not tear lengthwise, and has almost three times as much crosswise tear resistance as varnished cotton.

Complete cables tested

Load cycle over-voltage aging tests were carried out to indicate in-service reliability of the new insulation. Cables insulated with GE No. 1799 DG varnished Dacron glass, rated 15 kv, were subjected to voltages of 150% and 175% of the rated voltage. The cables were cycled simultaneously from room temperature to 90 C and from room temperature to 100 C.

Extensive tests of this nature on finished cables and in field service installations confirm the excellent improvement values offered to cable users by this new General Electric insulation.

Tape properties are greatly improved by G-E fabrication methods

Use of glass and Dacron, plus complete impregnation of the fabric with varnish, are primary reasons why G.E.'s new insulation offers longer life, easier handling, reduced insulation thickness, and greater current-carrying capacities, plus increased resistance to heat, corona, and moisture.

New pressure process

The base cloth consists of a woven fabric utilizing Dacron fibers and glass fibers, combined in accordance with rigid G-E specifications. It has a minimum of sizing to assure thorough impregnation of the fabric. Impregnation is accomplished through a pressure process which completely controls varnish viscosities, oven speeds, baking temperatures, and the conditioning of the base cloth.

Made only for cables

The G-E varnish is a high-grade, asphalt base, heat- and corona-resistant product. It's made by G.E. specially for use in cable insulation. Another advantage of the varnish is its "oiling out" characteristics which leave an oily film on the surface of the finished insulating cloth. This film serves as a lubricant to protect against tape tears due to bending of the cable during installation.

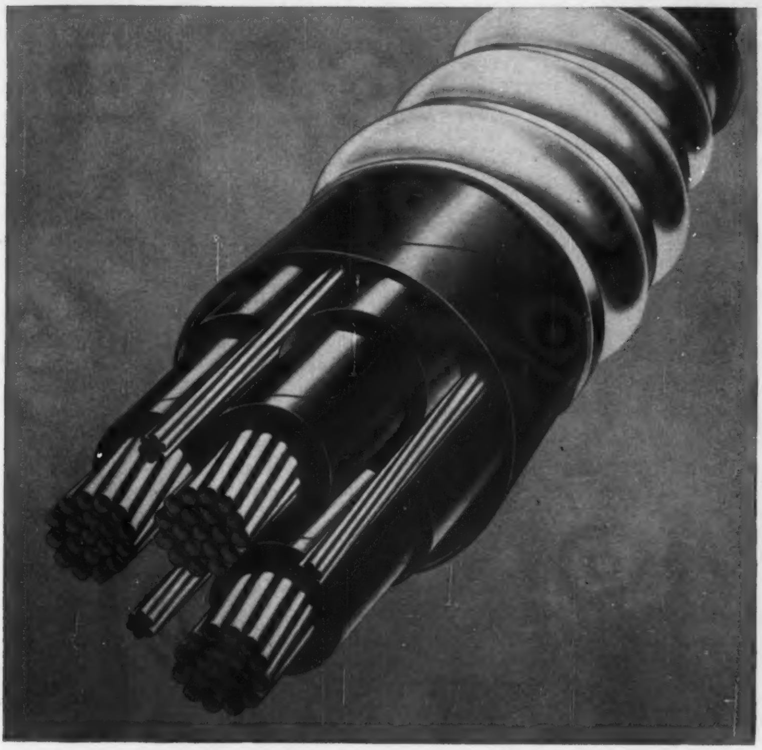
General Electric is the only wire and cable manufacturer that prepares its own varnished cloth, using materials and processes developed in its own laboratories.

Progress Is Our Most Important Product

GENERAL ELECTRIC

General Electric
CONDUCTOR THAT COUNTS

NEW CABLE CONSTRUCTION



NEW CONSTRUCTION GIVES ADDED VALUES TO G-E INTERLOCKED ARMOR CABLE

New features have been added to the construction of G-E Interlocked Armor Cable — GE No. 1799 DG varnished Dacron† glass tape insulation, Flamenol* jackets on individual conductors, and built-in ground wires. Here are the advantages of each:

1) Varnished Dacron glass insulation: Offers outstanding electrical stability and low-moisture absorption. Reduces insulation thickness, permits higher conductor temperatures. No shielding is required up to 8,000 volts.

2) Flamenol jackets: Protect insulation against moisture, flame, oils, acids, alkalies, ozone, and weather. Provide phase identification by numerals. Simplify terminating and splicing on non-shielded cables . . . only a lug and end seal are required.

3) Built-in ground wires provide a low-resistance ground circuit, a low-reactance fault return path, a positive relaying circuit, and positive and convenient equipment grounding.

These important new features are now added to the time-proved advantages of General Electric interlocked armor cable in a General Electric interlocked armor cable system — lower material cost, reduced space requirements, reduced materials handling, ease of installation, reduced installed costs. For further information on these new cables, just send in the coupon.

Complete line of cables with new insulation now available

These cables with GE No. 1799 DG varnished Dacron glass insulation are now available:

SI-12348: 600-volt power cable
SI-12350: 5000-volt power cable

Single or multi-conductor. Either braided over all for open wiring or installation in conduit in dry locations; or lead-sheathed for installation in conduit or ducts in wet locations.

SI-12381: 15-23 Kv Power Cable

Three-conductor. Lead sheathed for installation in conduits or ducts in wet locations.

Armored Cables — Submarine, Dredge, Borehole

Three-conductor, lead-sheathed for moisture protection; wire armored for mechanical protection under water and for vertical suspension.

Aerial Cable

Three-conductor, individually insulated and jacketed, preassembled to the messenger.

*Registered Trade-mark General Electric Company.
†duPont Registered Trade-mark.

General Electric Company
Wire and Cable Department
Section W244-427
Bridgeport 2, Conn.

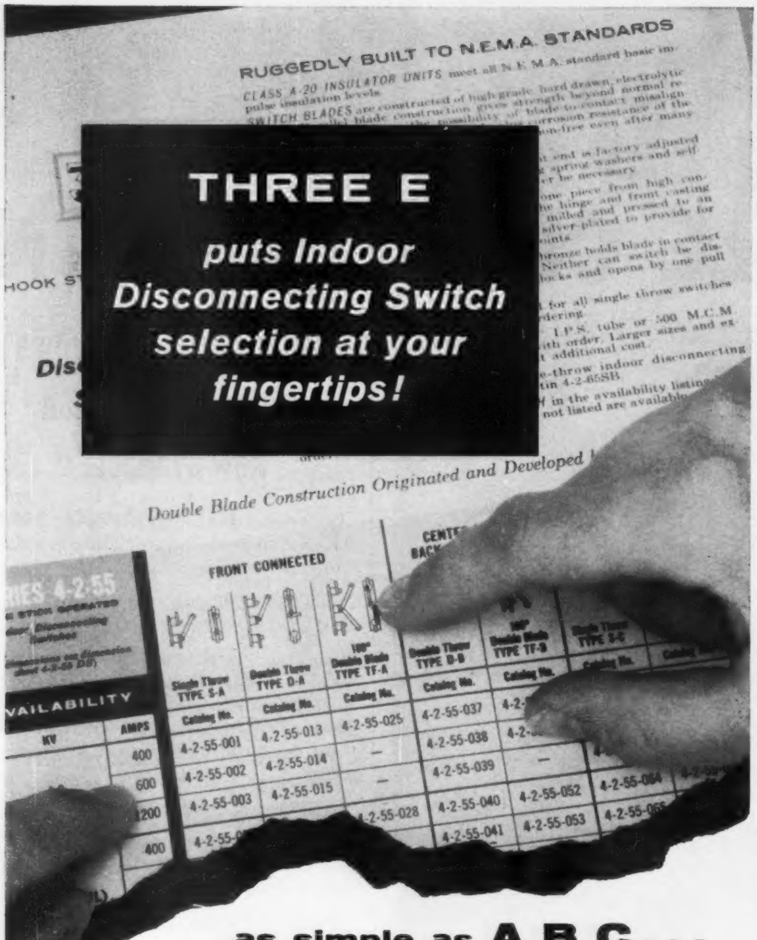
Please send me complete information on G-E cables now made with GE No. 1799 DG varnished Dacron glass insulation.

Name__________ Title__________

Address__________

Company__________

City__________ Zone_____ State_____


THREE E
puts Indoor Disconnecting Switch selection at your fingertips!
RUGGEDLY BUILT TO N.E.M.A. STANDARDS
Double Blade Construction Originated and Developed
FRONT CONNECTED
AVAILABILITY

as simple as A B C . . .

A *select the rating required*

B *pick the configuration needed*

C *record the ordering number*

3E Indoor Disconnecting Switches have set the standards of the industry! Exclusive double-blade construction originated and developed by 3E results in switches that outperform and outlast any other switches on the market. And now 3E offers the most complete, easiest-to-use, technical literature available . . .

Write today for your copy of **BULLETIN 4-2-55SB**

THREE E COMPANY
Melrose Park, Illinois
A DIVISION OF HUBBARD AND COMPANY

3E

Representatives in Principal Cities

New York Extends Street Lighting Program

New York City is continuing its battle against crime with the weapon of street lighting.

Mayor Robert F. Wagner, speaking over WRCA-TV, said that there would be no let-up in the city's war on crime in the streets and parks. He noted that the city is convinced that inadequate lighting of these areas encourages crime, and that New York is spending $8 million for new and more powerful street lights. Mayor Wagner listed 39 locations where improved lighting would be installed before June 30, 1961.

He also said that 3,000 new and more powerful street lights have been installed since September in high-crime areas, including 20 playgrounds. By June 30, 20 additional play areas will have modern lighting facilities, in addition to large sections of the east and west sides of Manhattan, lower Manhattan, and similar areas in the Bronx, Queens and Brooklyn.

"All this has involved 3,000 new luminaire lights," Wagner said, "and starting July 1 we shall increase it six-fold with 18,000 additional lights."

New York City's intensive street lighting program was spurred by a youth's murder in a poorly lighted city playground last September. (EW, Nov. 2, 1959, p 50-53; Nov. 9, 1959, p 45-46.)

This new program will be part of a plan to aid the police force, which is also being expanded, the Mayor noted.

Housepower Profit Clinic Aimed at Contractor Sales

A new Housepower Profit Clinic, designed to increase electrical sales by local contractors, has been formed by the Live Better Electrically Program.

The Clinic, an outgrowth of the Housepower Forum started three years ago, is a refresher course for electrical contractors who participated in earlier Forums.

An Edison Electric Institute

(*Continued on page* 168)

CUTS
assembly time
26%

*factory-attached, flush coupling △ no additional cost!

New **ORANGEBURG**® **CA*** **CONDUIT** with Flush Coupling Attached!

With no separate couplings to handle or attach on the job, Orangeburg CA lays faster, costs less to install. Each long, light length has a *flush* coupling attached at one end and a standard 2° male taper at the other end, making installation a simple, one-step operation. And, since the coupling *is* attached, there are no coupling cartons to warehouse or carry to the job.

What's more, with the coupling *flush* to the conduit's outside wall, new CA is easy to stack, store and handle. The flush coupling also eliminates "staggered" joints in the trench. And that means real savings in cutting and tooling time.

Like the hundreds of millions of feet of Orangeburg fibre conduit in use since 1893, new CA has self-sealing joints and impermeable walls. Its smooth, 100% fibre raceway adds years to cable life.

New Orangeburg CA is available in 2", 3", 3½", 4", 4½" and 5" sizes. Orangeburg Standard and Nocrete Conduit, with separate sleeve couplings, are available as always. Write Dept. EW-40 for Catalog 52.

ORANGEBURG MANUFACTURING CO.
Orangeburg, New York

Division of The Flintkote Company, Manufacturer of America's Broadest Line of Building Products FLINTKOTE

Orangeburg Fibre Conduit is distributed by Graybar Electric Co. and General Electric Supply Co. with branches and stocks in principal cities.

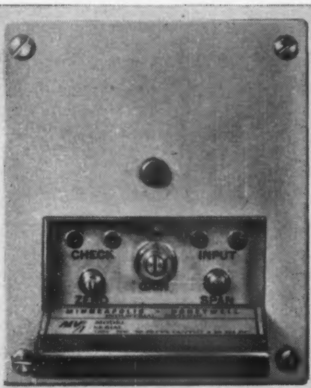
Telemeter and record

...with Honeywell Instruments

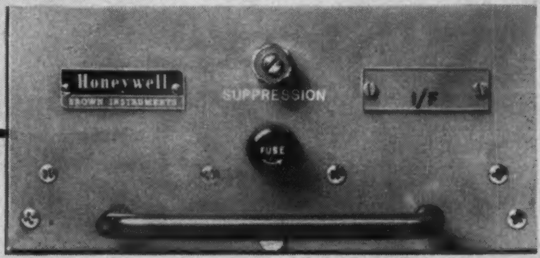
Combine the reliability and accuracy of the new Honeywell telemetering system with the traditional excellence of *ElectroniK* recorders . . . and you have an unbeatable combination for handling central station data.

Use the fully-transistorized telemetering system for load, control intelligence, or any variable that can be transduced into an electrical signal. It's designed to meet all central station requirements, and is suitable for carrier, microwave or direct-wire line channels.

Use *ElectroniK* instruments to record and indicate all telemetered variables with speed, precision and sensitivity . . . to give a clear, continuous,



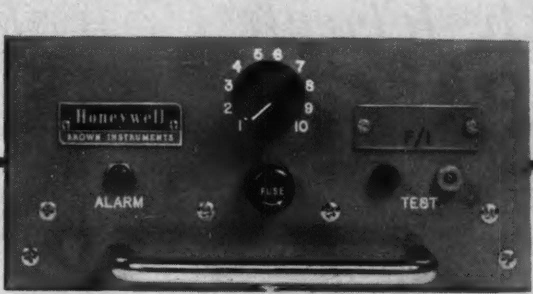
Millivolt-to-current transducer converts the mv signal of the sensing element to current.



Current-to-frequency transmitter converts current to a transmittable frequency that is a measure of the original variable.

HONEYWELL TELEMETERING SYSTEM . . . FULLY TRANSISTORIZED FOR GREATEST LONG-TERM RELIABILITY

Modular construction makes possible the unusual flexibility of this advanced telemetering system. The three basic units—transducer, transmitter, receiver—can be used in various combinations to provide the exact type of telemetering you need. The basic units mount two-abreast in standard relay racks. This fast-responding, frequency-type system gains stability and compactness through all-transistor design.



Frequency-to-current receiver converts the transmitted signal for recording and/or control purposes.

all variables...

permanent record of system operation.

Your nearby Honeywell field engineer can help you match the telemetering system and *ElectroniK* recorders to your requirements. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

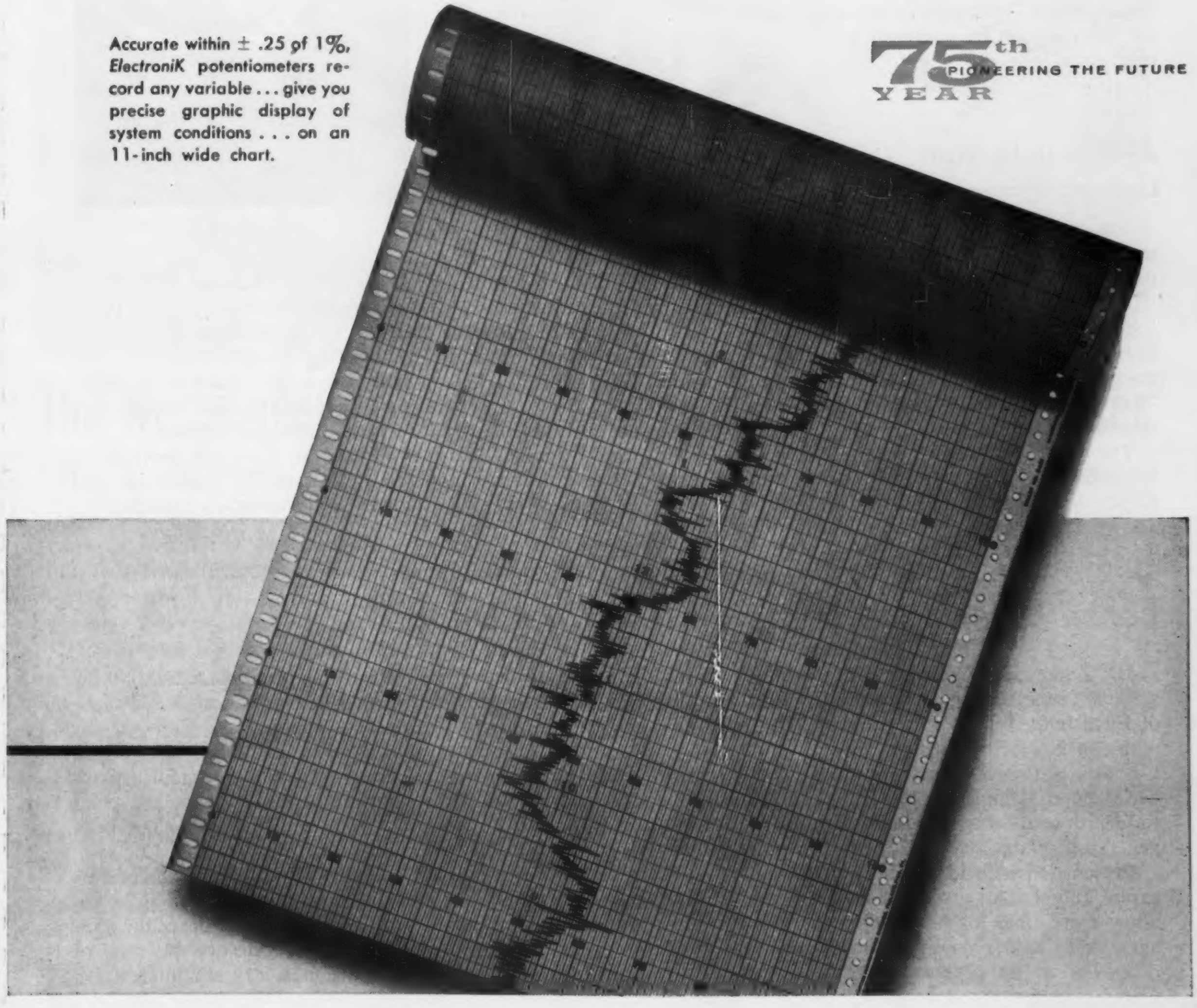
Honeywell

H HONEYWELL First in Control

SINCE 1885

Accurate within ± .25 of 1%, *ElectroniK* potentiometers record any variable . . . give you precise graphic display of system conditions . . . on an 11-inch wide chart.

75th YEAR PIONEERING THE FUTURE



Housepower Profit Clinic

(*Continued from page* 164)

spokesman said that the Clinic will do more than promote wiring. It will give the contractor product and sales data on load building appliances, thus enabling him to be better qualified to understand the residential wiring needs of the modern Medallion Home, he said.

The Profit Clinic consists of five packaged meetings, with an optional sixth, to suit local needs and plans. It has an integrated kit of audio-visual aids that includes a slidefilm, flip chart, and printed material for distribution; a new step-by-step approach to selling electrical extras, selling the new home market; and a review of selling basic wiring.

A highlight of the Clinic, will be an original manufacturer-to-contractor sales aid, an exclusive kit of "sight sellers," prepared especially for the Program by electrical manufacturers.

AP&L Installs Yard Lighting Promotion

Arkansas Power & Light Co is the latest utility to get into the electric yard light promotion market.

AP&L is cooperating with electrical contractors in making a Ready Lite available to customers. Contractors will furnish and install the "Ready Lite" in a normal installation for $33.50.

The yard light has a photo-electric cell, is mounted on a rust-proof, black aluminum post, and has a 115-v weather-proof receptacle for plugging in electrical equipment such as lawn mowers.

Arkansas P&L Vice President W. M. Shepherd said that the company is making the Ready Lite available in response to requests from customers who want to purchase electric yard lights and pay for them on their electric bills.

Yard light purchasers can finance the installation and make payment through contracts with AP&L. Monthly installments will be arranged over periods up to 24 months.

Cooking Conference Scheduled for May 10

The 11th Annual Commercial Cooking Conference, sponsored by the Commercial Cooking & Water Heating Committee of Edison Electric Institute, will be held Tuesday, May 10, at the Sheraton Towers, Chicago.

Major areas covered at this Conference will be marketing, sales, and use of commercial electric cooking equipment.

Speakers on the program will include: E. A. Wilson, vice president, Alabama Power Co; W. L. Byrne, assistant manager of the sales, marketing and public relations department, Ebasco Services Inc; Murray Joslin and O. A. Hill, Commonwealth Edison Co; and R. T. Layfield, Georgia Power Co.

The Conference is being held to coincide with the National Restaurant Assn convention and exhibit.

Sees Ten-Year Dramatic Increase in Lighting

Within the next decade the use of lighting will be in the hundreds of foot-candles, George J. Taylor, vice-president, Day-Brite Lighting Co, told the Illuminating Engineering Society and guests of Union Electric Co at a recent meeting in St. Louis.

Taylor, former IES president, pointed out that the electric industry's ability to produce higher lighting levels made his prediction practical.

TAYLOR

The Blackwell research is not the final answer on lighting, said Everett M. Strong, professor of electrical engineering, Cornell University. Fidelity, as well as quantity in lighting, is needed, he said, urging more research in the universities.

Architects, electrical contractors, representatives of industrial and commercial customers attended.

Lease Extension Sought on NW Coal Deposits

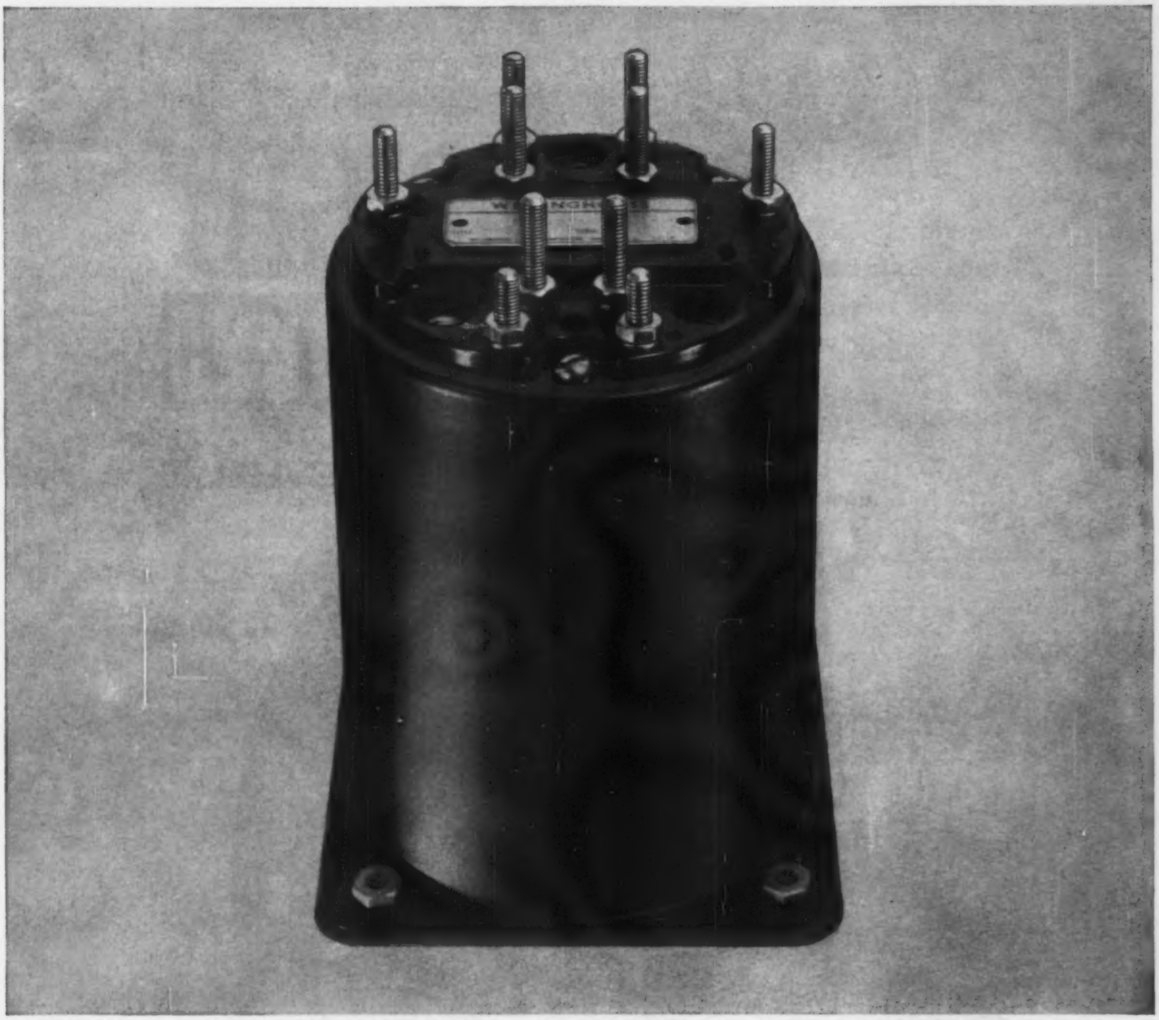
H. Zinder & Associates, consultants to the Kittitas County PUD of Ellensburg, Wash., is negotiating with the Northern Pacific Railway Co for a two-year extension of leases on coal mines in the county to furnish coal for a proposed steam generating plant.

Present leases held by the PUD expire July 1. An extension would allow more time for negotiation of agreements with prospective buyers of power to be generated by the plant, said Earl Coe, state conservation director and an exofficio member of the state power advisory committee.

"We feel that some time in the next two years the market will be right for distributors who want to protect their power supplies," Coe said. "We have very definite indications that private and public power utilities are interested in buying the power."

A state-financed study by Zinder indicated feasibility of a 250,000-kw plant selling power at 5 mills per kw, in combination with surplus power from the Bonneville Power Administration. Original plans called for completion of the plant in 1963 but this date has been changed to 1964 or 1965, Coe said.

Signing of power sale agreements would open the way for steps toward arranging financing of the $55-million plant. Questionable state of hydro licenses may stir interest.



The Westinghouse VP-840 hall generator watt transducer

No moving parts, no tubes, no thermal elements

This new transducer utilizes the Hall Effect* principle to convert single-phase or polyphase watts into d-c millivolts. In addition to the fact that this transducer gives **instantaneous response, vital to automatic control,** it offers further advantages in that it provides high overload capacity and a considerable cost saving, too.

The VP-840 is supplied for either single-phase or polyphase circuits, with or without a built-in filter. **With a filter,** it operates high-impedance devices such as telemetering transmitters, high-gain servoamplifiers, or potentiometric type recorders. **Without the filter,** it is used with low-impedance devices such as direct-acting instruments for the measurement of watts or vars or with magnetic amplifiers in systems control.

Applied with a simple conventional d-c millivolt meter, this new transducer eliminates the complex multiple coil dynamometer mechanisms previously required for the measurement of power. J-40526

30
60
90
120
150
A-C KILOWATTS

KP-241 wattmeters and varmeters incorporate the transducer circuit in a complete instrument assembly. Watts applied to the instrument terminals are converted to a proportional d-c voltage which operates our exclusive TBS (Taut Band Suspension) d-c instrument mechanism.

For a complete rundown on this revolutionary new development, call your Westinghouse sales engineer or write for Catalog Section 43-840, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

---

*If a conductor carries a current at right angles to a magnetic field, a charge difference is generated on the surface of the conductor in a direction which is mutually perpendicular to both the field and the current.

YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS

Another Utility Installs...

POWERIGHT PARANITE®

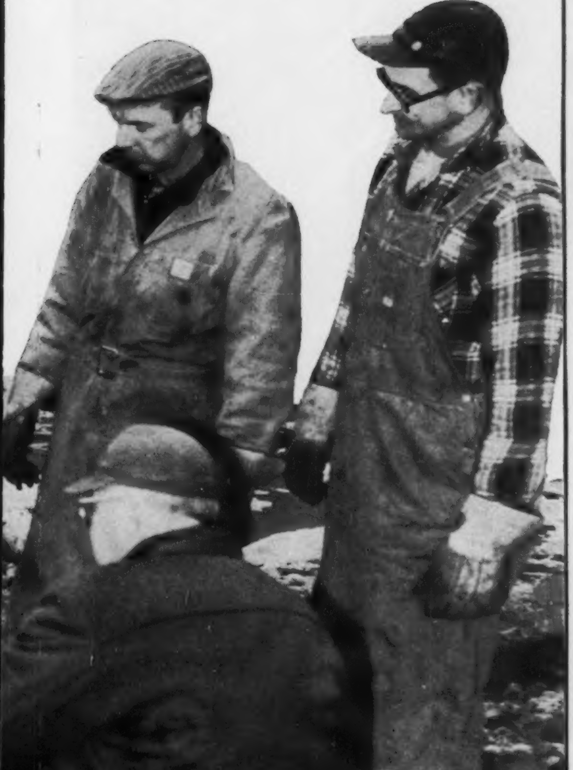
POWER CABLE

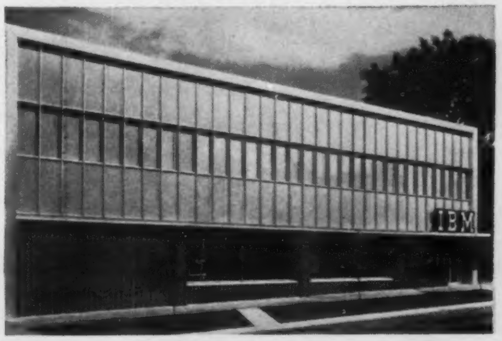
PARANITE WIRE & CABLE DIV. ESSEX

A modern electronic computor system at South Bend, Indiana, is serviced by Paranite Super-Pararite® Paraprene® network cable installed by the Indiana & Michigan Electric Company. Three Paranite network cables were laid parallel in underground ducts from the primary circuit to the new I B M building.

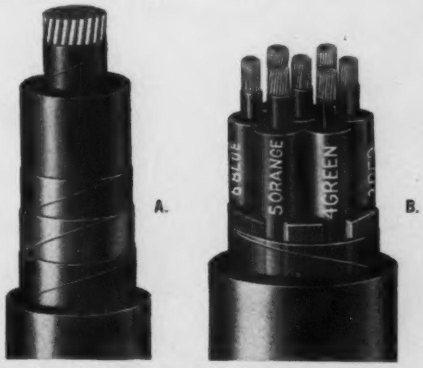
From 600 V. network through 28,000 V. power cables, Paranite has proven its dependability in coast-to-coast power installations. Paranite's engineering department invites your inquiry on specific problems relating to your application.

PARANITE WIRE & CABLE PRODUCTS
WIRE AND CABLE DIVISION
ESSEX WIRE CORPORATION, Marion, Indiana
MANUFACTURING PLANTS: Marion, Ind.; Jonesboro, Ind.; Tiffin, Ohio; Anaheim, Calif.
Sales Offices and Redistribution Warehouses in all Principal Cities





This recently completed IBM Branch office at South Bend, Indiana, handles the load of Data Processing Machines servicing nine counties in Northern Indiana and Southern Michigan.



A. Paranite HIGH VOLTAGE CABLES are manufactured in a complete range of sizes — 1000 V. through 28,000 V. single conductor, 3000 and 5000 three conductor. Adaptable for aerial, direct burial or underground duct installation, wet or dry location.

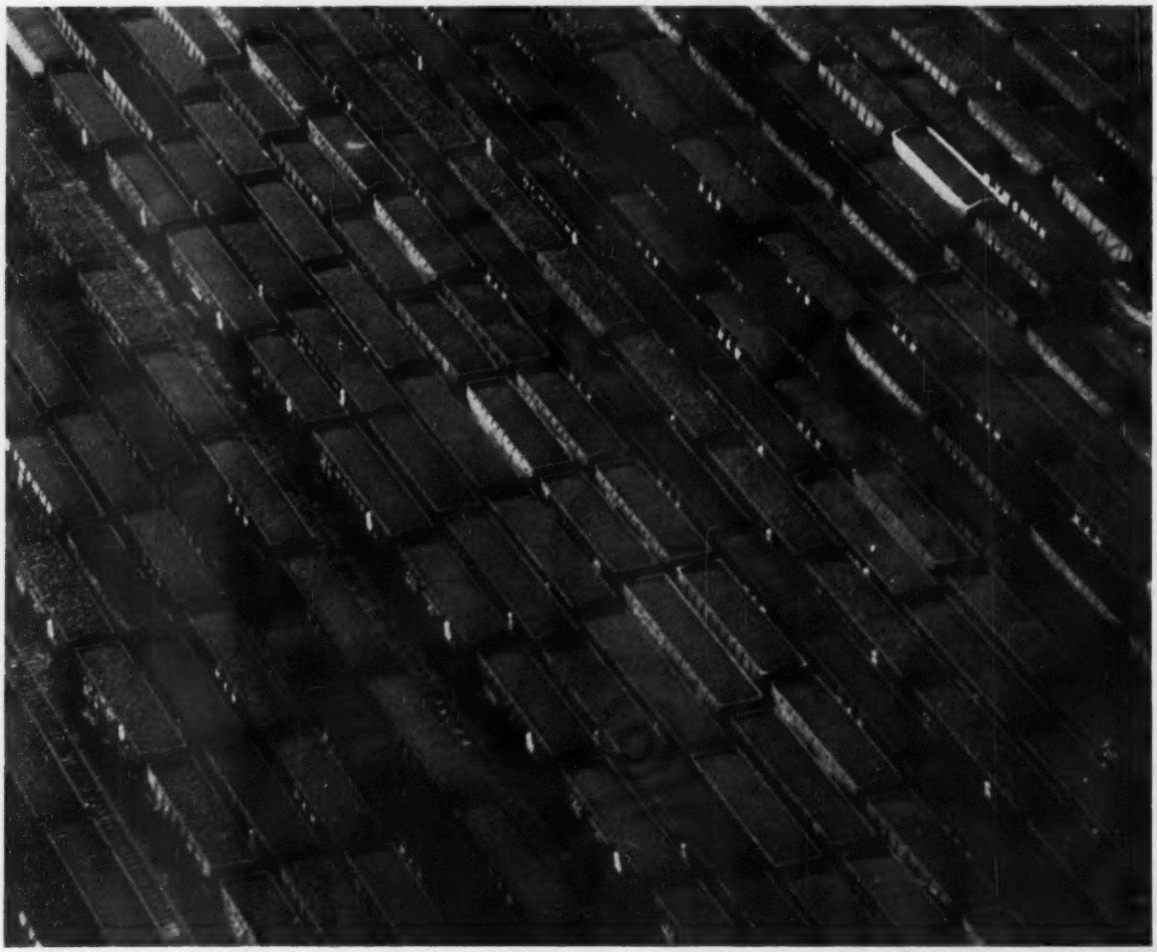
B. Paranite CONTROL CABLES are produced in a complete range of insulation and jacket types. Rubber, PVC or Polyethylene insulations are available to meet a variety of service temperature conditions.

how long?...10 years?...20?...50?

(A utility needs to know!)

There has never been much room for short-term thinking in the utility business. But probably never before have utility executives and engineers been taking *the long look* in so many operating areas.

Take coal, for instance. They've been asking themselves and their coal suppliers some pointed questions: "Can we count on these suppliers to deliver the kind and quantity of coal we're going to need in the years ahead? Have they adequate reserves? Is this coal costing us over and above its invoice price in excessive coal handling, ash handling, equipment outages, freight charges on inerts? Or is it coal that eliminates these frequently overlooked incremental costs, delivers highest operating efficiency and steam at the lowest cost?" The answers you'll get to such questions from Island Creek are the kind that let you plan ahead with confidence. We at Island Creek would welcome a chance to sit down with you for a thoroughgoing discussion. Write, wire or phone.



You can depend on Island Creek . . . a career company dedicated to coal

ISLAND CREEK
Precisioneered Coal

Island Creek Coal Sales Company, Chafin Building, Huntington 18, West Virginia . Chicago . Cincinnati . Cleveland . Detroit . Greensboro . New York . Pittsburgh

On March 29th, John R. Conrad, president of S&C Electric Co, stood up and delivered a free-swinging blow in defense of profits, and a strong call for industry leadership in the sixties, before the American Power Conference in Chicago.

His appeal to re-equate morality with profits takes a different form than the AT&T studies on profits and progress we published in these pages late last year. We present his talk here, in a condensed version, so the entire industry can sample his views.

Portions of his speech allude to the moral implications of the recent price-fixing charges leveled at some other electrical apparatus manufacturers.

Will We Re-equate Morality With Profits?

Profit has become an ugly word to some people. And to associate it with morality seems to compound the felony. This has become an unfortunate chapter in our economic history, for I believe the degree of morality that we attach to the concept of profit during the sixties will largely determine the degree of prosperity that we can achieve.

I do not accept the optimistic predictions of some that the "soaring sixties" are an accomplished fact. Quite the contrary, I have a feeling of ominous foreboding that this decade could go down in history as the "sorry sixties"—for our industry in particular, if not for the economy as a whole.

The profit mechanism has governed the direction of our economy. Is this right and proper? As Ernest Hemingway once said, "What is moral is what you feel good after, and what is immoral is what you feel bad after." Will we, in the sixties, equate morality with profits? Will we seek profits with pride, or will we apologize for profits? Will we proudly admit that the primary purpose of our corporate endeavors is to provide a useful service or product at a reasonable profit? And will we sell the idea that profit makes business progress?

To many, profit is associated with such motives as selfishness, avarice, and thirst for power. The whole term is surrounded by emotional overtones. Why has profit fallen into disrepute? Partly, the academic world is to blame. Some centuries ago, the economists used the word profit to mean excessive earnings, and they drew a moralistic line of distinction between reasonable earnings and excessive earnings. The word profit became the symbol for all that was thought bad about earnings.

Many 20th Century economists think we ought to simply do away with the word "profit," and substitute some euphemism, such as "earnings." But personally, I think that would be side-stepping the issue. The problem is not one of language. It is the concept of profits, not the word, that must be reunited with morality.

For centuries, people have been taking pot-shots at profits. The socialists put profits on the defensive back in the 1800's. Their strategy was simple—to choke off capitalism, they said, just choke off profits. Then they proceeded to build their case around the human frailties that could come from exposure to profits. They pointed to the "robber barons" as examples of the system as a whole; but they ignored the role of profits as the driving force behind our economy. Close behind came the poison of Karl Marx, the ivory tower denunciations of the Fabian socialists, and finally, within range of our own memories, the scorching indictments of Roosevelt and his New Dealers.

Little wonder that by the 1930's profits had be-

Here is the real immorality . . .

come something bad in many people's minds; something to be controlled, curtailed, even confiscated.

The war on profits has advanced from the mind and the classroom to the realities of the everyday world; down to the very councils of government. Without waiting to resolve the issue of capitalism versus socialism on an ideological basis, new taxes on profit have been imposed in this country to do more than just collect revenues. Profits would no longer be permitted to concentrate in the hands of a few. Wealth would be redistributed through taxation for the benefit of the populace as a whole.

Amazingly, what has happened before our very eyes is a compromise settlement between capitalism and socialism. Capitalism, to the extent that it stood for the concentration of property in the hands of a few, has been diffused—not by appropriation or confiscation, but by an evolutionary spreading of wealth through the erosion of taxes. Meanwhile, socialism has been watered down and seeped right into our economy.

What we find ourselves with now is a form of people's capitalism; the ownership of the nation's wealth has been diffused from the favored few to the masses of millions. Personally, I accept our people's capitalism without equivocation. It has done away with some of the objections to classic, 19th Century capitalism, and it has skirted many of the ominous pitfalls of socialism as well. Yet, it has brought with it a new rash of problems which remain to be solved. The success or failure of people's capitalism will be determined by how we solve these present-day problems. And chief among them is the restoration of morality to profit.

A proper view of profits is essential for us to achieve, operate, and maintain a dynamic form of people's capitalism. The other nations of the world have reached nearly complete recovery. Their ability to compete in our domestic markets, as well as in world markets, was proven in the fifties.

". . . let me set the stage by quoting from a book called Profits, by William T. Foster and Waddill Catchings:"

The epic in which the profit motive . . . became dominant was precisely the one that brought the most effective utilization of new inventions, the most extensive development of labor saving devices, the most rapid increase in real wages, the greatest accumulation of capital facilities, the largest total volume of production. No other period in the world's history showed such progress in public health, in medicine, in free schools, in transportation, and, generally speaking, in the means of gratifying human wants.

Will they overtake us in the sixties? Will the spark of our dynamic economy be smothered by outdated prejudices against profits? If not, then our profit system had better get another chance to work at peak efficiency, which involves a simple recognition that profits are the lifeblood of our economy. They are no longer enjoyed by the few; they go to the millions. Profit has got to be, and deserves to be, treated as a necessary constituent of our social order.

Of course, since we continue to espouse a modified, mixed free enterprise system, it follows that we need some impersonal mechanism to measure our individual wants, and meter capital formation and flow. Prices and profits perform this function. If we refuse to accept this mechanism, then collective control by bureaucrats is the alternative. If prices are not free to move with supply and demand, then the real wants of our people cannot be measured and provided for. If profits are not free of restraints, capital cannot be raised and directed into channels where it best serves the wants of the people.

Immorality of No-Profit

Suppose now we take a negative look at profits and morality. Let's examine the immorality of no-profit. Consider the personal income tax laws. Look what they are doing to our citizens. A taxpayer may know the old story about excessive versus insufficient taxes—that execssive taxation breeds too little profit, while insufficient taxation lines the pockets of a few at the expense of many. But a taxpayer has his own ideas about what is proper; in fact, he probably believes his taxes border on confiscation. As a consequence, a perfectly honest person may rationalize his moral concepts to justify every means, fair or foul, to keep the government from stealing what he considers rightfully his own.

Thus, he may adopt wholesale expense account living. Technically, it is within the law, since at the root is some form of business benefit. But if the government did not foot about 50% of the bill, frugality in business would not be so conspicuous by its absence. Business entertainment has reached fantastic proportions, with yachts, hunting lodges and convention junkets. This wastefulness has an abandon about it that can contaminate the character of a people. The immorality of it may be subtle, but it is there.

The no-profit from high taxes permeates other areas. I would wager that over one half of the corporate mergers and consolidations, going on at a frightening pace today, have at their root a simple scheme to translate income into capital gains to reduce the tax bite. Many men specialize in the traffic of companies. But they are not driven by the motive of making a useful contribution to our economy. All they want to do is buy up and spin off, picking up their quick bucks from manipulations, rather than from the sweat, toil, and dedication for a product or service. This kind of monkey-business demoralizes business.

No-profit from high taxes takes on many more

an uneconomic diversion of resources

insidious twists. Consider the time and talent of top executives that is being expended on the less productive activities of business. You will find an alarming concentration of executive time being spent on finance, law and public relations. These fields are important, but they should not be permitted to monopolize the attention of top executives.

The job of a business leader should be to provide the inspiration and the informed, top level direction that an organization needs and does not get today. Some of today's most resourceful business minds are in law, investment banking and public relations. But wouldn't it be better for our economy if we needed only half as many of them, so that the balance could be expending their energies and drives in creative leadership?

High taxes shouldn't bear all the blame for immorality. If no-profits would always lead quickly to bankruptcy, many of these immoralities would not be with us. But oddly, our economy has many safeties structured into it to forestall bankruptcy. All sorts of schemes pop up to prolong the survival of the economically unfit. Some are quite ingenious; many border on circumvention of law.

A possibly notorious example is the price-fixing conspiracy charge leveled against some members of the electrical apparatus industry by the Antitrust Division of the Attorney General's Office.

Since Federal Grand Jury indictments have been handed down only recently, alleged guilt of the defendants has not been settled under due process of law. So let us not go into the details.

Product Profit and Survival

Suppose the government is able to prove its charges in court. What conclusions could we draw? The companies involved would obviously have committed violations of law. But the irony is that the profits of these defendants have not been inflated by these actions. They were, and are, substandard for most of the products within the scope of the alleged conspiracy. Survival, we would conclude, was the motivating force. Product profit and survival was at stake—not company profit and survival.

If the conspiracy is proven, it could be said that it represents the demands put on middle echelon managements to deliver profits on specific products. But the authority of these managers over their products is limited to pricing. They have no line authority over research, engineering or manufacturing. Similarly, segmentation of duties within utility organizations has produced a similar preoccupation with price among the people who do the actual buying. In the marketplace, equipment has been reduced to a commodity, with price as the only basis for purchase. The product managers found their product quality and product features were subordinate to the price tag. The temptation was great to participate in price fixing conspiracies. What else could they do?

I am not condoning what may have taken place. Rigged prices, in whatever form, for whatever purpose, violate and interfere with the mechanism of prices. If depressed prices force the discontinuance of some products by some manufacturers, then they should be discontinued. If depressed prices mean liquidation for the marginal producers, then liquidation it is to be. Only in this way, by allowing our economy to run its free course, can we reach desirable economic ends.

But our economy is now so shackled by distortions of economic law that a condition of no-profit does not necessarily start the automatic process of self correction as it should. No-profit breeds desperate measures for survival. The end seems to justify the means, particularly if the victims feel they have been denied a fair chance to make a profit to begin with.

What has this done to the kind of quality we are getting today as buyers for our companies? The no-profit that suppliers are expected to "earn" today encourages many of them to chisel on the performance, the design and the workmanship. All competition becomes price competition. Competition is supposed to mean more than price battles—but it does not unless the buyer is enlightened. No-profit has forced many manufacturers of industrial goods to cut corners and to design down to the point of holding things together until installation.

And why not? Right in our own backyard the electrical apparatus manufacturers are on the horns of a dilemma. Because rate regulation has forced a misplaced emphasis on first cost, some utilities are showing an increasing reluctance to rigorously examine and evaluate the equipment they buy. In many circles, price alone determines who gets the order. The evaluation of intangibles—performance, service, reliability, supplier integrity, product life and maintenance—is tossed to the winds because these values can't be reduced to dollars and cents.

With his equipment looked upon as a commodity, the manufacturer finds himself hopelessly in a corner. What recourse does he have but to offer buyer-beware merchandise?

Is buyer-beware merchandise moral? Is it moral for rate regulation to force first cost to overshadow a product's true value? Who profits in such a situation?

There is nothing wrong with constructive cost cutting. But if all the talents and energies of engineering have to be diverted down such channels there is not much left over for exploring the blue skies and creating radical departures from the orthodox. Yet, this exploring is the only real way to progress. The no-profit climate of our industry is stifling the possibilities for breakthroughs to really new designs. Here is the real immorality—an uneconomic diversion of resources.

Do you see where no-profit leads us? It diverts the flow of capital and human effort from where it should go. This is immoral. Profit is moral because it permits capital to flow where it will do the most real good for all.

If the sixties are to soar, we must take a radical departure from the prejudices of the past. Take our own industry as an example. It sits on a plateau. It is a mature industry; it doesn't have the bounce and fire of a dynamic industry. And the fact that the electric utility industry is a regulated one further complicates the matter. Profits take more than the average beating because it is the job of regulation to assure that profits are restricted.

So let's start with rate regulation. This is based on one principle premise—a fair rate of return on investment. How preposterous! What is a "fair" return? The word "fair" is full of emotion. Until prejudices concerning profits are removed, there is little hope for much consideration on this front.

Our industry's earnings cannot be restricted to something close to the cost of capital. The era of low cost debt may be at an end. Then what is going to happen to the growth of our industry? Already it misses the spark of venture capital to innovate on a broad front. Maturity and orthodoxy have set in. If we persist in thinking that earnings of around 6% are ample, petrified orthodoxy is the next stage, and shortly thereafter, atrophism.

Profit Starvation

This profit starvation of the electric utilities has started a process of self destruction. In the throes of self-pity, many a utility has set upon the hides of it suppliers. If it can't make money, no one else can have the right to make money from the utility, seems to be the attitude.

This dog-eat-dog attitude can degenerate to cannibalism. It is incumbent on the electric power industry, utilities and manufacturers alike, to drop all notions about the nastiness of profit.

The industry also needs a resurgence of leadership. With people's capitalism doing away with the entrepreneur, we no longer need fear the robber baron. But his demise has left a vacuum that the chief executives of today have not filled entirely. They have been submerged in the paperwork of finance, law, and public relations. The board chairmen and presidents must drop their preoccupations with these activities. For the electric utilities and manufacturers alike, our top echelon people must again provide inspiration, vision, and statesmanship.

Our chief executives need to get their hands dirty again with the multitudinous problems that go with their services and products. They cannot continue to abdicate this responsibility for business leadership to middle echelon management.

Our top level people must acquire a command of the details, as did the old entrepreneurs. In this way we can get the exercise of their judgment and the benefit of their decisions, and they can also steer the optimum course for venture capital.

Inspiration, vision and statesmanship, emanating from our leaders, can cure many of the ills I have been talking about. People are at their greatest when they have a cause. They are better, tougher, less selfish, and finer people when they have a goal set in front of them—a challenge to meet.

If once again we can give our employees a sense of pride and a feeling of accomplishment, their loyalty and dedication will naturally follow. If we restore the romance of the job, we will again attract all we need in the way of young, aggressive, and highly competent graduates—now being lured into the glamour fields.

As a third step, we need more lofty goals than just nuclear power. If our top level people were on the firing line more often, they would find opportunities for pioneering everywhere. Universal adoption of electric space heating is one opportunity. Why should we leave the spreading of this gospel to a few visionaries of the industry?

Another opportunity is getting power distribution underground. The overhead lines of the electric utilities are a blight on every residential and commercial community of our land. Besides, service continuity is constantly at the mercy of the weather.

As another goal, we have got to replace brute force engineering with creative engineering. Utilities must demand and be ready to accept more innovations from their suppliers. And the suppliers must show more ingenuity and courage in meeting the higher voltage and the higher current requirements of today and tomorrow with more than merely bigger and beefier equipment.

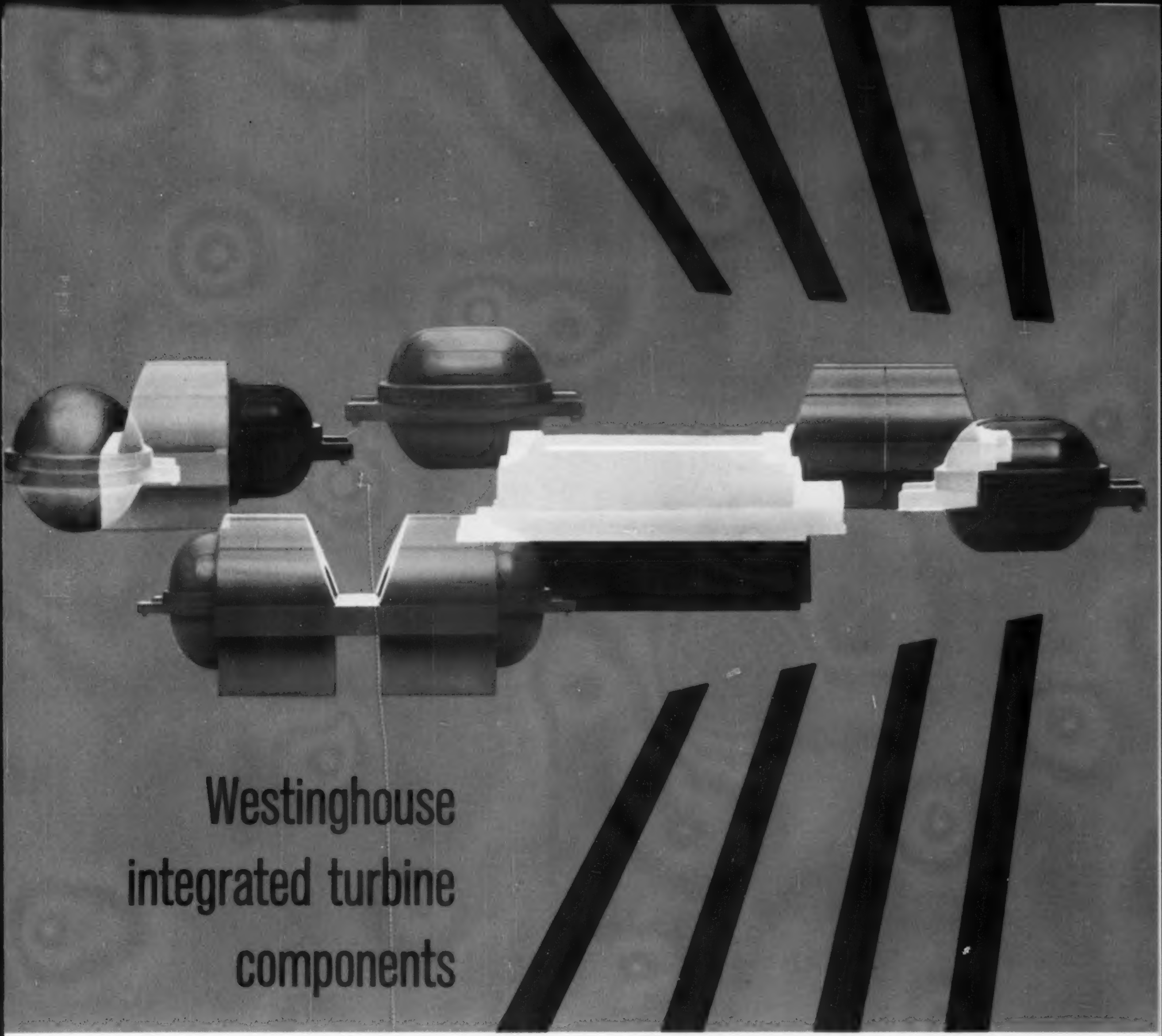
These, then, are some major steps I believe our industry must take to make the sixties soar. And other industries must be a partner in this kind of thinking. Even the glamour industries of today can become the sick industries of tomorrow, unless we restore the good name of profit to our economy.

Profit is the most effective means yet devised for generating and metering capital and human effort for the ultimate satisfaction of man's needs. If we will agree that serving man's needs is a noble goal for our society, then we must agree that profit is similarly noble and moral.

John R. Conrad . . .

Heads one of the last-remaining, independently owned companies in electrical apparatus manufacturing. Equally at home in the shop, the office, or the field, he subscribes to the mastery of detail of the old entrepreneurs, keeps close control by ranging some 50,000 miles a year from his Chicago headquarters to coordinate the activities of his 700 employees, 10 sales offices, and 15 sales representatives in the U. S. and Canada.

Conrad left the University of Chicago in 1937 with a BS degree in economics, and decided to build his future in aviation. After a stint at Boeing School of Aeronautics, where he studied aerodynamics and airline operations, he joined Douglas Aircraft in 1939. By 1943 he was directing all the industrial engineering, plant engineering, and tooling effort at Douglas' Long Beach, Calif., plant; the world's largest with 42,000 employees. He left Douglas to join S&C as vice president in late 1945. This company was started by his father in 1910. He became president in 1952.



Westinghouse integrated turbine components

—major breakthrough to economical superload growth

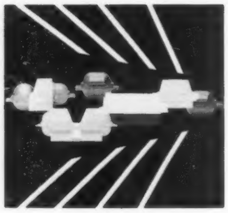
Design flexibility, low maintenance, fast delivery, controlled costs, all in complex, high-capacity machines—these are the barriers which Westinghouse Integrated Component Design has overcome to meet the demands of the next 20 years.

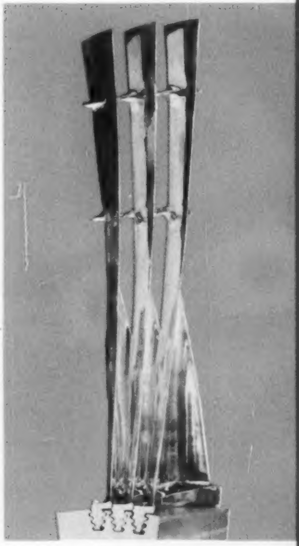
Progress and development cannot cease at this point, however. Electric utilities, and the manufacturers who supply their needs, will continue to face the challenge of constant load growth indefinitely into the future.

In past reports, we've discussed present progress leading to a capacity of 600 million kw by 1980. We've also shown how Integrated Component Design has freed designers and scientists for the vital development projects described on the following pages. Even now underway, these projects promise further assurance of helping you meet your future power needs economically.

YOU CAN BE SURE...IF IT'S Westinghouse

integrated components assure continued advances in design efficiency and economy





28-inch blades

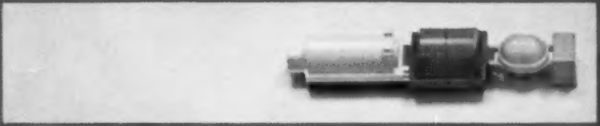
Pre-engineered turbine components will free creative man power needed to carry on the development programs in metallurgy, thermodynamics and mechanical design which will lead to continued advances in turbine efficiency and economy.

ADVANCED THINKING ALREADY AT WORK ON TOMORROW'S DEVELOPMENTS

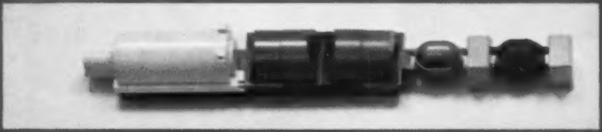
As a result of progress in mechanical and thermodynamic design projects, designers have already proceeded with layouts of 3600-rpm elements using a new 28-in. last-row blade.

This design, used on a recent 325-mw cross-compound unit, promises to reduce size and weight. Designers plan to adapt the 28-in. low pressure elements to all the turbines shown below by merely modifying existing elements to reflect this latest design advance. Each unit arrangement is given a complete design analysis to determine its feasibility.

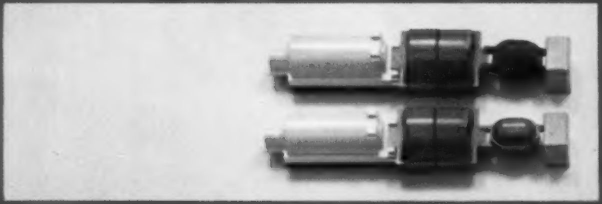
These improved blades will contribute to the achievement of ratings as high as 1500 mw, and steam conditions of 6000 psi at 1200° F.



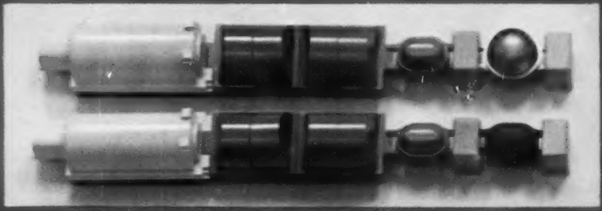
Tandem-compound two-flow



Tandem-compound four-flow



Cross-compound four-flow



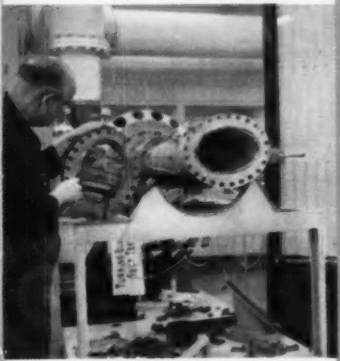
Cross-compound eight-flow

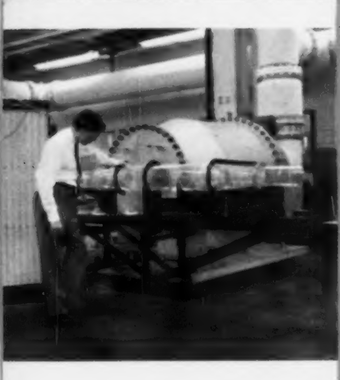
MORE EFFICIENT STEAM FLOW

The air-flow test models shown here in the Steam Division Laboratory (right) are used to simulate the flow of steam through portions of the turbine. From these experimental studies, pressure losses are progressively reduced.

The model shown at lower right illustrates a new concept in crossover piping economy. The pipe-within-a-pipe arrangement maintains low pressure drop, while economizing on materials and space. Exhaustive tests on this model have proven the effectiveness of the arrangement.

These and other projects and a planned facilities expansion amounting to nearly 25 million dollars, are your guarantee of capacity to meet all your power needs economically.





Westinghouse is now designing generators of 512-mva capacity

Current research into metals, new excitation systems, and many other advanced materials and methods are making it possible *now* for Westinghouse to match a generator (1) to any turbine of the future.

Two basic breakthroughs have been responsible for today's giant capacities—Thermalastic® insulation (2) and Inner-Cooling (3). These exclusive advances have opened the door to future capacity developments.

Excitation systems also are undergoing revolutionary changes (4). Current-collecting parts such as commutators, collector rings and brushes, which require removal and replacement, may disappear entirely through the use of silicon semiconductors. These semiconductors act as rectifiers and will enable us to substitute an a-c generator for the conventional d-c exciter. Such a system is now being assembled (5).

Other projects include the search for better steels, alloys and compositions; electrical sheet steel with better magnetic properties in all directions; Thermalastic insulation; and a host of other developments.

The advanced studies going on in Westinghouse laboratories will prove vital in helping you meet future power needs economically.

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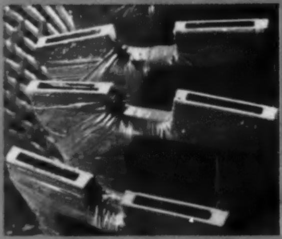
2



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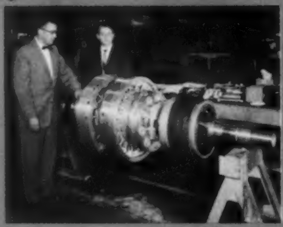

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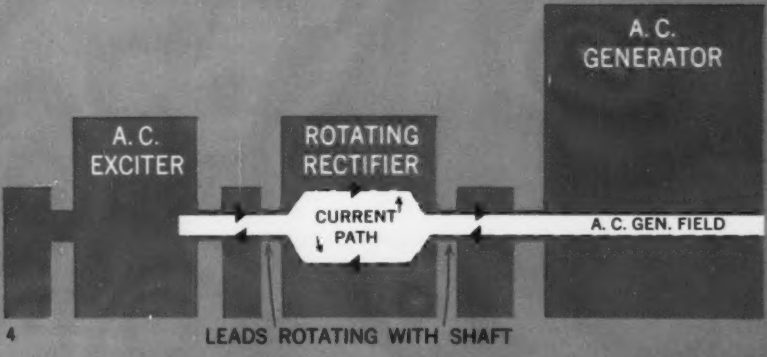

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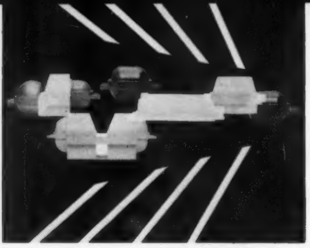
YOU CAN BE **SURE**...IF IT'S **Westinghouse**



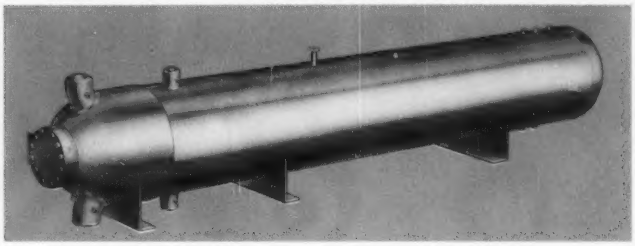
heat transfer apparatus progress keeps pace with turbines and generators

The design flexibility of Westinghouse condensers, coupled with a full line of auxiliaries, makes it possible even today to design them to the Integrated Component practice now in use with turbine-generators, thus giving highest efficiencies at lowest cost.

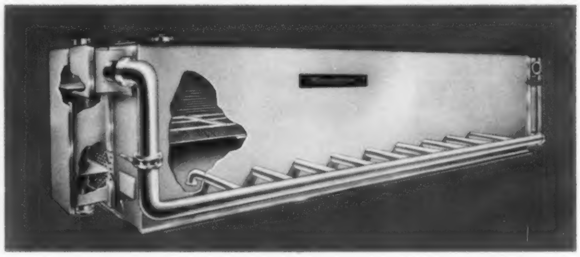
Continuing research and development for even greater improvements in the future are proceeding in the heat transfer area, too.

RESULTS OF CURRENT RESEARCH

In the realm of present, practical developments resulting from Westinghouse research, two innovations stand out prominently.

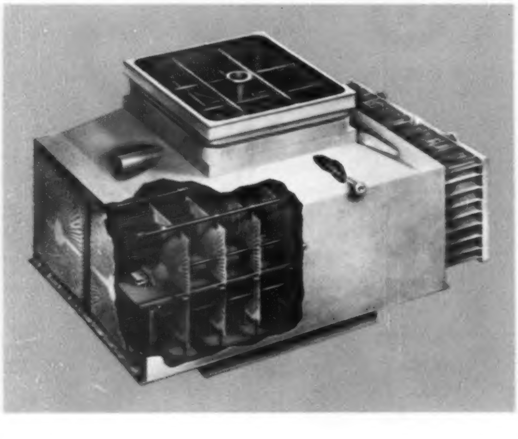


New high pressure feedwater heaters are a direct result of research and development in nuclear steam generators. The new hemispherical, welded head, high pressure unit is especially adapted to the increased temperature and pressure requirements of the large turbine steam cycle. In designing more efficient, economical generating equipment, Westinghouse has developed welding techniques to meet extreme conditions of temperature and pressure.



The flash evaporator provides a low-cost means of making ultrahigh purity water for boiler feed make-up from either fresh or salt water. This minimizes any thermal loss to turbine heat rate, and reduces initial cost of the power plant.

These, and many more, developments are your further assurance of the industry's soundest power generation equipment investment.



DEVELOPMENT PROGRAMS NOW IN PROGRESS

LOWER COST FOUNDATIONS—Westinghouse research and development engineers are exploring new structural designs that promise to lower the weight and size of surface condensers and result in lower foundation costs.

DROPWISE CONDENSATION FOR IMPROVED HEAT TRANSFER—Westinghouse is evaluating water repellents which show promise of keeping the tubes nonwettable throughout the life of the condenser. This will result in improved heat transfer rates and permit a reduction in size, weight and cost.

MATERIALS FOR LONGER LIFE—In the Westinghouse Steam Development Laboratory, engineers are busy studying ways to prolong the life of waterboxes and pump components by utilizing newly available materials and protective coatings.

REDUCTION OF AERODYNAMIC LOSSES—Westinghouse engineers are probing means of reducing all the interrelated causes of aerodynamic losses in the transition section between the turbine and the condenser. This will result in design changes which will give the industry condensers that are not only smaller, but more efficient.

As a result of progress already made, Westinghouse is ready now to help you plan, design and build complete generating stations with built-in expandability to meet all future power needs economically. Call or write Westinghouse Electric Corporation, Steam Division, Lester Branch P.O., Philadelphia 13, Pennsylvania. J1-50612

YOU CAN BE SURE...IF IT'S

Westinghouse

Litho in U.S.A.

OFFICIAL UNITED STATES NAVY PHOTOGRAPH

This great seaborne health center will carry a new kind of aid abroad—*with your help.* Part of the people-to-people project Hope, it will enlist 200 specialists in sharing our health skills.

Ambassador with a blackboard, the Hope specialist will help the often woefully few local medical technicians train helpers. The result: many more hands. And that means one Hope dollar is multiplied many times over.

YOUR HELP CAN COME BACK A HUNDRED TIMES OVER

One local doctor for 100,000 people. These are the odds Hope may face. Yet Hope can mean so much. The health of this child. The health of five Indonesians. *Trained* hands and only a dollar's worth of penicillin can cure them of crippling yaws.

If enough of us help, the S.S. Hope will be outbound in 1960. First port of call: Indonesia. A bold health project called Hope will be underway.

The need is crucial. Many places, too many health hazards exist. Too many people robbed of the will to live. Too few hands to help. Often, a doctor for 100,000.

Hope's approach is *practical.* Help where a nation's doctors ask help. Help them help themselves to health. By training, upgrade skills—multiply hands. Hope's doctors, dentists, nurses, and technicians will man a center complete to 300-bed mobile unit and portable TV.

You can not only make every dollar do the work of many, you can earn a priceless dividend. With health comes self-respect. People at peace with themselves are less likely to war with others.

Hope is *yours* to give. It's a people-to-people project. For one year's worth, 3½ million Americans must give a dollar. Don't wait to be asked. Mail a dollar or more now to HOPE, Box 9808, Washington 15, D.C.

HELP LAUNCH HOPE

Forman Made a Vice President

H. P. Forman has been elected vice president-public relations of Puget Sound Power & Light Co.

Forman joined Puget Sound P&L in 1955 as assistant to the president and was named public relations director in 1959.

He began his business career in 1934 as a newspaper reporter, and then joined the Crowell Publishing Co in advertising and sales promotion. For ten years he was with Western Electric Co. In 1948, he joined the New York Telephone Co serving as information manager.

He has been a member of the National Advertising Council and president and director of the House Magazine Institute.

Evans, Lagrone Named VPs At Westinghouse Electric

Westinghouse Electric Corp has named two new vice presidents: Marshall K. Evans as vice president and director of management services, including financial planning and control; and P. T. Lagrone, vice president in charge of the company's Southeastern region.

Evans joined Westinghouse in 1943, advancing through the company's accounting organization with positions in operating divisions and at the company headquarters. He was appointed budget director of the company in 1954. In 1958, he was named director of management services with staff responsibility for financial planning and control, management compensation, systems and methods analysis, and organization planning.

Replacing Otis O. Rae who retires May 1, Lagrone moves up from assistant regional manager for Westinghouse in the Southeast. He joined the manufacturer in 1923. From 1926 to 1947 he was with Mississippi Power & Light Co, then rejoined Westinghouse in 1947.

In 1950, he was appointed electric utility manager for the central region, and in 1955 was named manager of the electric utility sales department. He went to New Orleans in 1958 as apparatus district manager.

EVANS

LAGRONE

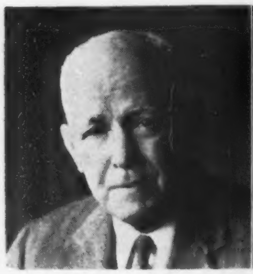
Riley Stoker Names New Chairman, President and VP

Riley Stoker Corp has named a new chairman of the board and a new president. Louis E. Griffith was elected board chairman and Robert K. Griffith was made president and treasurer.

Louis Griffith, who was formerly president, is now also general manager and vice president in addition to being chairman.

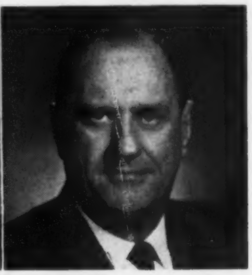
Robert Griffith, the new president, was formerly vice president and treasurer.

Alexander L. Mitchell has been appointed a vice president. He has had charge of the Chicago office and will now supervise operation of that branch, along with the Cincinnati, Kansas City, St. Louis and St. Paul offices.



L. E. GRIFFITH

R. K. GRIFFITH



MITCHELL

(*More News About People, p* 184)

Steel towers Go up fast, Stay up long

...And it's mighty helpful to be working with a local steel tower supplier.

PG&E general foreman Frank Pereira, shown supervising erection of double-circuit 110-kv towers near San Francisco. These towers have a 67½-ft standard body plus leg extensions varying from 2½ to 65 ft. Maximum span length on this line is 1,555 ft.

Tower erection supervisors know what it means to have their steel tower supplier close at hand. It means speedy service. And that's important when you're working on a tight schedule, with steel erectors right on the heels of the footing crews, and the wire-stringers close behind.

Emergencies can snarl up a schedule like that. But, with a local supplier, a standard piece can be shipped out on a day's notice. Even special parts take only a week or so. That kind of service really pays off.

NEW LINE BOOSTS LOCAL POWER SUPPLY . . . In Contra Costa County, east of San Francisco, PG&E is nearing completion of an 8½ mile line from the company's Pittsburg Power Plant to the Clayton substation. This double-circuit, high-voltage line will make an additional 60,000 kilowatts available to the East Bay metropolitan area. It required 52 galvanized steel towers, fabricated at Bethlehem's South San Francisco tower shop. PG&E crews can put up a tower a day.

LONG LIFE . . . Reports indicate that galvanized steel towers have a service life of up to fifty years, even in coastal regions. Of course, painting increases their life indefinitely.

THREE SHOPS MEAN TOP-FLIGHT SERVICE . . . Bethlehem operates three big, fully equipped tower shops. Two are located on the West Coast, at South San Francisco and Seattle. Eastern requirements are handled at Leetsdale, Pa., near Pittsburgh.

For towers and switchyard structures made to American standards—*your* standards—call on Bethlehem Steel. Our nearest sales office would be pleased to discuss your requirements.

When you deal with American firms you're investing in service, because only domestic suppliers can meet your emergency requirements. America's tower-fabricating industry must be kept healthy, so it can be on the job when you need it.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

***Export Distributor:* Bethlehem Steel Export Corporation**

PERSONAL BRIEFS

Duane H. Renner, formerly in Northern States Power Co's information and advertising department in Minneapolis, has been placed in charge of public information for NSP, Wisconsin.

James R. Underkofler has been named controller of Wisconsin Power & Light Co, and **John E. Zwettler** has been named assistant controller. **L. W. Hanson** was appointed budget and accounting research director. All three positions are newly created.

William Jensen, apprentice operator at Washington Water Power Co's Nine Mile power plant, has received the U. S. Air Force's Exceptional Service Award and Medal, its highest civilian award, for rescuing an airman thrown from a helicopter into the Spokane River as the result of a crash.

Public Service Co of Colorado has named **M. Gordon Parker,** director of area development to head a special department to aid rapidly expanding Colorado cities with their growth problems.

Ebasco Services Inc has appointed **Paul M. Dollard** to the general management consulting staff.

Lauran G. Clapp has been named to the newly created post of community relations director, San Diego Gas & Electric Co.

Old Dominion Power Co has boosted **Walter Craig Groves** to division transmission engineer.

Boston Edison Co has made the following promotions: **Carl O. Wilson,** head of the Stock Division in the stores department; **Thomas J. Quin,** assistant head; **Francis L. Archibald,** head of Mechanical and Statistical Division, production department; **Joseph A. Murphy,** head of the Chemical and Processing Division, production department; **Alonzo Taylor** and **Clarence A. Russell** municipal sales representatives; and **Alan R. Davis,** supervising engineer.

Public Service Electric & Gas Co has elected **Charles W. Engelhard** a member of the Board of Directors. Chairman of the board and president of Engelhard Industries, Inc, he succeeds the late **Horace K. Corbin.**

James F. Dunlevy has been named to the newly created position of supervisor of industrial development for Pennsylvania Power Co.

Niagara Mohawk Power Corp has made **Francis G. Schafer,** manager of the Herkimer-Ilion district; **Robert J. Gillen,** assistant manager of publicity and advertising for the Western Division; **Donald Gaffney,** superintendent of the Lake Shore Area; **William Borst,** sales supervisor of the Gloversville area; **Raymond F. Wellner,** assistant service superintendent in Syracuse. New office supervisors in the Eastern Division are: **Vernon A. Uhlinger,** Saratoga; **Harold G. Kelly,** Saratoga; and **William J. Charlson,** Hudson.

Public Service Co of Oklahoma has named **B. J. Harris,** commercial manager in McAlester; **Keith Roulet,** Okmulgee new business manager; and **Homer E. Page,** chief engineer at the Lawton Power Station.

Duquesne Light Co has promoted **Norman B. Eberts** to district engineer, eastern district transmission and distribution; and **Russell K. Goldstrom** to chief clerk, downtown district, T&D.

Clayton K. Larson has been named assistant to the treasurer of Northern States Power Co.

Donald O. McCarthy has been named assistant production manager for Petrothene polyethylene resins by U. S. Industrial Chemicals Co.

Chester F. Mitchell has been named engineering consultant to the RT&E Corp. He recently retired as regulation engineer at Commonwealth Edison Co.

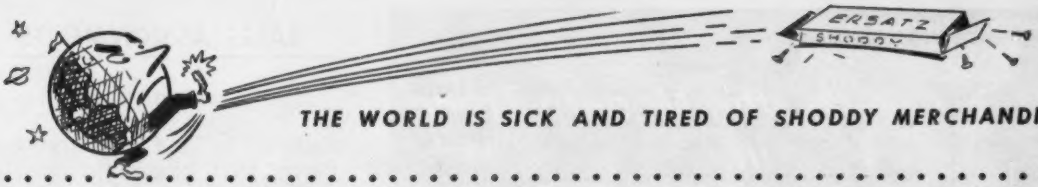
Martin J. Gauger has been made assistant to the president, and **Richard F. Nelson,** comptroller, at Continental-Diamond Fibre Corp.

Allis-Chalmers Manufacturing Co has made **T. G. A. Sillers,** manager of a new power systems engineering department to provide special services and coordination in planning and development of systems and in the application of products for the generation, transmission and distribution of electric power. **G. W. Bloedorn** has also been named to the department. **L. W. Harris, William H. Spiller,** and **Edward J. Kleine** have been named to the Power Equipment Division. Harris and Spiller are assistant engineers in the mechanical design section, steam turbine department, and Kleine is application engineer in the regulator department. **Robert G. Benston** has been made application engineer in the industrial systems department, **Harold Franz,** application engineer, West Allis centrifugal pump department; and **Dale K. Russell,** application engineer, electrical department, Norwood Works. Other appointments at Allis-Chalmers are: **Robert C. Bown,** assistant manager, rectifier section; **D. B. Scott,** manager, control department; **S. M. Austin,** assistant manager, and **W. E. Ellingen,** engineer-in-charge of sales, heat transfer products, heat transfer department; **W. Glenn Williams,** manager of product sales, rectifier section; **William S. Farmer,** manager of a new planning department, nuclear power department; and **Joseph H. Blachly,** project manager.

OBITUARY

William G. Scotton, 64, district line superintendent for Pacific Power & Light Co . . . **Herbert Lawrence Vail Sr,** 57, distribution supervisor for Virginia Electric & Power Co . . . **William S. Deptula,** 59, Niagara Mohawk Power Corp's supervisor of the East Buffalo office . . . **Wilbur W. German,** 56, a vice president of the Montana Power Co . . . **George Robert Strandberg,** 71, one of the world's foremost engineers in hydroelectric power development, and a member of Stone & Webster Engineering Corp since 1912.

(*More News About People, p* 186)



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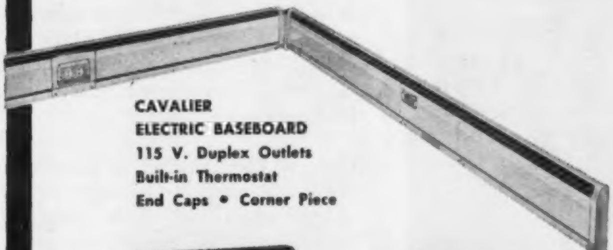

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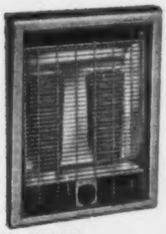
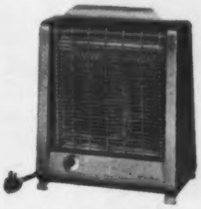
End Caps • Corner Piece



**CAVALIER
WALL INSERT**
1 to 5 KW



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in safety
in sales making features*

P & K OUTDOOR LIGHTING REPORT
the Modern Trend in LOW LEVEL LIGHTING
RATH PARK

TOP PHOTO: Location: Fairleigh Dickinson University, Madison, N. J. • Electrical Consultant: H. L. Sykes
LOWER PHOTO: Location: Rath Park, Franklin Square, L. I., N. Y. • Architect: Herbert D. Phillips
Consulting Engineers: Barstow, Mulligan & Vollmer

P&K CIRCLElux DAVITS & POSTS

modern lighting at a realistic cost

Here are two contemporary outdoor lighting installations – one an all new municipal swimming pool and recreational area – the other, a prominent New Jersey University. Both chose the P&K all aluminum CIRCLElux lighting package to illuminate and compliment their roadways, walkways, landscape and architecture.

The sweeping lines of the P&K CIRCLElux davit blend with the modern one story architecture of the Rath Park Swimming Pool. Yet, the modern, but stately, design of the P&K CIRCLElux post is in good taste with the traditional architecture of Fairleigh Dickinson University. The CIRCLElux lighting package is the correct low level lighting choice to compliment almost all types of architecture.

The P&K CIRCLElux is available in a wide range of davit styles and mounting heights. The post is available in one basic design but at various mounting heights and with the CIRCLElux you have a choice of three light sources – incandescent, mercury vapor and fluorescent. This combination of luminaires and davits or posts will enable you to specify "packaged" lighting units. This means easier specifying by using matched components which in turn can customize your lighting projects.

Send in your reservation now for the *new* CIRCLElux catalog.

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SALES ASSIGNMENTS

COMPANY STAFFS

Highway Trailer Co has appointed Baxter L. Schroeder western regional sales manager of the Utility Division. He will be in charge of all sales programming in that area.

Clark Controller Co has opened a new sub-office at 1122 Dryades St, New Orleans. The new office will serve southern Louisiana, below Vernon, Rapides, and Avoyelles parishes and the border of the Mississippi. It will be operated by Butler & Land and will be under the directon of R. F. Davidson.

Graybar Electric Co, Inc, has named E. A. Grimes district sales manager of the Allegheny District, which includes Pittsburgh, Erie, and Greensburg, Pa.; Youngstown, Ohio; and Buffalo, N. Y.

General Electric Co has appointed George E. Shepherd manager of the newly established New England sales district for the silicone products department. The district will have responsibility for Massachusetts, Rhode Island, Maine, New Hampshire, Vermont, Connecticut, and upstate New York, and will be located at 145 North Beacon St, Boston 35, Mass. Kendall P. Rehwaldt has been appointed district manager of the Los Angeles district of General Electric Supply Co.

REPRESENTATIVES

Allis-Chalmers Manufacturing Co has appointed three representatives to its Southwest Region; Warren W. Chapman, Shreveport district; T. J. Curlee Jr, Beaumont district; and Duane L. Miller, Amarillo district. James Barrett has been made sales representative in the El Paso district. Appointed sales representatives in the North Central Region were: Warren D. Chin, Minneapolis district; and Donald H. Kuenning, Milwaukee district. Edwin C. Neuman has been made sales representative in the York, Pa., district, and Donald B. Cutler was named regional serviceman, North Central region.

30% TO 50% LIGHTER WEIGHT, UNIT SHIPMENT MEAN YOU GET . . .

Fast, Easy Installation with General Electric Air-Blast Breakers

Installation of General Electric's air-blast circuit breakers is so simple it takes only a fraction of the time normally required to install comparable oil breakers. Here's why:

- **Units are 30 to 50% lighter** than comparably-rated oil breakers. They can be handled with one light-duty crane—no need to skid and jack them into place.
- **Current transformers and insulating columns are integral units.** Shipped in one piece, they are easy to unload and to lift onto foundation pads.
- **Interrupter heads are shipped complete,** ready to be lifted onto the support insulators and bolted into place after protective crating has been removed.

Why settle for less? For fast, easy installation, for practical protection for transmission systems 115 to 460 kilovolts and beyond, and for reduced maintenance, turn to General Electric air-blast circuit breakers. Contact your G-E Sales Engineer for more information. Or write to Section 494-05, General Electric Co., Schenectady 5, New York.

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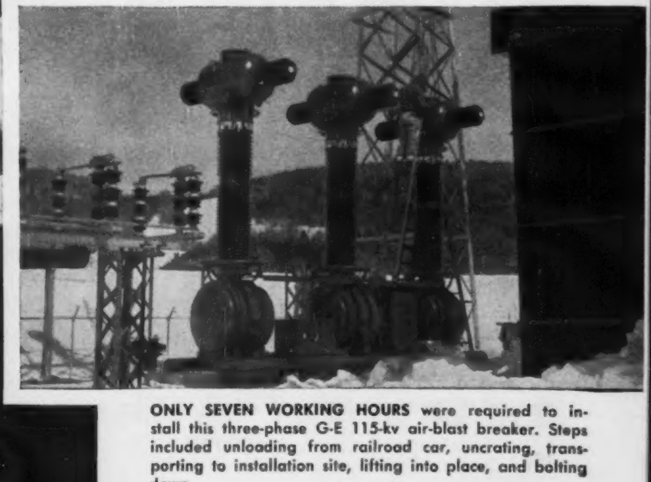

ONLY SEVEN WORKING HOURS were required to install this three-phase G-E 115-kv air-blast breaker. Steps included unloading from railroad car, uncrating, transporting to installation site, lifting into place, and bolting down.

modifications made to the hydraulic system, and clearances of connecting linkages have been modified to correct the trouble.

The 180-Mw dual-cycle boiling reactor plant, about 50 miles southwest of Chicago, will be operated by 92 men in seven catagories. Only one of the seven groups, the 23-man technical staff, is unique to a nuclear plant.

Northern States Power Co's Pathfinder Atomic Power Plant, designed by Allis-Chalmers, is scheduled for criticality in 1962, said C. R. Braun and C. B. Graham, Allis-Chalmers. It will be the first prototype atomic plant in the U.S. to employ nuclear superheat. It will raise steam temperature from the controlled recirculation boiling reactor from 489F to 600 psi to 825F and develop a net station output of 60.7 Mw with an overall net plant heat rate of 30.5%.

If nuclear superheated steam at 1,000F can be supplied to modern turbine units, heat rate reductions of 10 to 25% can be attained in an atomic plant. The resulting lower capital cost in the conventional part of the higher-efficiency plant is expected to more than compensate for the cost of nuclear superheater. A 1-Btu heat reduction in a 300-Mw plant can reflect a $3,000 to $6,000 capitalized saving and is the incentive for developing nuclear superheat, they said.

Looking ahead many years to 1,000-Mw plants, using multiple reactors in parallel, the authors saw possibilities of attaining steam temperatures of 2,000F using ceramic fuels in nuclear superheat reactors.

Conclusions developed from a study of the economics of nuclear power reported by W. L. Budge and B. L. Lloyd, Westinghouse, were:

1. Nuclear plants will be competitive for some time only in very large sizes.

2. Trends in fuel costs indicated nuclear plants may well be competitive in some areas more rapidly than has been anticipated.

3. On systems where nuclear plants are competitive, the best future economic pattern will be obtained with a combination of nuclear and conventional plants.

4. Nuclear plants will take over the base load, high load-factor portion of the load duration curve; conventional plants, the upper.

Feasibility of the liquid fluidized bed nuclear reactor is being investigated for AEC by the Martin Nuclear Division, said M. C. Scheve, of that company. This reactor concept, he said, aims at simplifying reactor operation and reducing costs. In the liquid fluidized bed reactor, fuel pellets rest on a perforated plate whose holes are large enough to permit rapid water flow yet small enough to prevent the pellets from falling through.

When resting on the plate, the pellets are too close to support a chain reaction. When pumps cause the liquid to surge upward, the pellets tend to rise and separate to make room for the upward flowing liquid. The pellets can be separated enough by control of the flow to maintain a power-producing chain reaction.

132 Kv Put on RR Towers

Railroad right-of-way for transmission lines out of the 650-Mw Eddystone Station avoided the complexities of threading such lines through densely populated areas, said E. B. Shew and A. H. Sellers, Philadelphia Electric Co.

Pennsylvania Railroad R/W and optimum electric power routes were strikingly similar, otherwise underground construction would have been necessary to a great degree. As it turned out 90 of the 104 miles of 132-kv line are overhead, 58 miles on railroad property. Thus only 13 miles of high-pressure pipe cable were required.

Railroad electrification structures were extended to afford room for one and, in some instances, two 132-kv lines. On a few non-electrified freight lines new H-column structures were built.

A half-mile-long 132-kv crossing over the Delaware River was necessary for the interconnection with Public Service E&G Co. Air traffic rules held tower height to 343 ft, and ship traffic limited sag to 110 ft, so that special high-strength phase conductors and shield wires were used. These had breaking strengths of 92,000 and 83,000 lb, respectively, loaded to 50% of capacity. Aluminum towers were used in a 3-mile section passing through a highly corrosive atmosphere.

Ohio Edison Co's use of bundle conductors permitted modification of broken-wire requirements and the use of economical lightweight, narrow-base 345-kv towers, said C. R. Bond, Ohio Edison, and F. A. Denbrock, Commonwealth Associates. Savings in structure costs came to 50%. The design employs principles similar to those incorporated in conventional H-frame construction. By restraining swing in the middle phase, designers cut tower arm length from 64 to 54.5 ft, thereby reducing tower weight and right-of-way width requirements. Between five and six structures are used per mile, or about 28 tons of steel, including angle towers.

Tests are nearly completed on the conductors at the high-altitude, 345-kv test line at Leadville, Colo., said J. E. O'Neil, Westinghouse, and L. M. Robertson, PS of Colorado. But testing will continue at 230 kv on smaller conductors.

Some aging is beginning to show up, but not in the amount experienced on conductors in contaminated atmospheres, they said, noting that data are still needed on foul-weather conductor performance.

Improved design and protection reduced the costs of EHV apparatus to where 345-kv lines can be justified in the U.S. at 50 miles, said G. D. Breuer, H. O. Simmons, and C. A. Woodrow, General Electric. Higher voltages, around 460 kv, they said, appear attractive for 200 miles or longer

The high cost of terminal equipment has made dc transmission unattractive for overhead circuits and probably for cable in the near future, they said. Bundle conductors are making voltages of 115 to 161 kv attractive for short, high-power lines. System short-circuit bottlenecks have been eliminated, and today truly high-power systems can be built around standard 15-million kva breaker ratings.

C. F. Wagner and A. R. Hileman, Westingthouse, described a new

(*Continued on page* 190)

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Optimum Station Design, Plus Savings in Engineering Manhours

General Electric engineers have put digital computers to work to help custom-tailor outdoor stations. Result: You get optimum station design with minimum time required by your engineers.

Structural design is specified by General Electric engineers after detailed study of line requirements, and wind, ice and soil conditions. Use of digital computers assures that structural members have the required safety factor and lightest possible weight. Savings in material are passed on to you, of course.

You may choose aluminum or galvanized steel structures when you select a General Electric-designed station. Furthermore, you have a choice of lattice-work type structures, or rolled-shape columns, as illustrated. Either way, you get the responsibility of one manufacturer, from design "up".

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DIGITAL COMPUTERS ARE USED to help G-E engineers design a station to met your exact system requirements at minimum cost.

AMERICAN POWER CONFERENCE (Continued from page 188)

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method of predicting transmission-line lightning performance. Past failure to take proper account of the charge above the tower, they said, explains why high lightning-outage rates on some EHV lines remained mysterious. Disputing that these outages were due to high rates of rise of current, they said that available data indicate that stroke currents curves are concave upward, suggesting that rates of rise are in excess of 2 μsec.

Discussing computers for planning system generation expansion, C. D. Galloway, General Electric, said that the problem is to devise alternate ways of expansion, each based on equal reliability, and then to study their relative economics. In typical studies, 1 to 4 min of computer time can simulate a year's actual operation. He described ways for determining the worth of different degrees of reliability.

Accurate determination of reliability and of cost was discussed by Galloway's co-author, L. K. Kirchmayer, also General Electric. New types of generation, such as nuclear, and their effect on the operation of other units, the latter said, have complicated cost determinations, so that some computations require computer analysis.

Capital savings may be realized through automatic operation of power systems when attention is directed to improvements in efficiency and equipment design from the beginning, reported C. Concordia, General Electric. High-speed automatic digital computers make practicable the simultaneous economic design of all the parts of a distribution system.

A 705 computer studied the economics of 2,860 condensers for a 300-Mw unit, reported M. H. Archbold, Frank V. Miholits, Ami Leidner, and C. E. Person, Commonwealth Edison Co. At $200 per hr the computer cost was $6,000 (for 30 hr of machine time). Costs were reduced in the next study by considering only 600 condensers.

An automatic generation controller and computer on the Carolina P&L Co's eastern area system saved an estimated $30,000 a year in transmission system losses, declared W. J. Brogden. It also provided accurate and continuous automatic economic loading of units so as to save more dollars, and permitted steam capacity to do the regulating job at more savings. Moreover, the computer was available for the study of system problems.

Commonwealth Edison successfully coordinated digital programs with network analyzers for short-circuit studies involving system planning and relay application, according to Homer E. Brown, G. L. Landgren, and William Thorn. The technique was worked out cooperatively with American Electric Power and General Electric. It affords economy, accuracy, availability of re-runs.

J. Wallace and R. E. Gilbreath, Westinghouse, described an automatic system for ac network calculators which has cut system readout time in half. The equipment is programmed by paper tape and uses a typewriter to program tape and print out data.

Computer studies show that primary distribution at 24.9 kv promises much for the future, said R. F. Lawrence, Westinghouse. But 34.5 kv has a poor future. Studies, he said, also show that 13.2 kv is a good primary voltage up to rather high load densities. The computer studies explored these questions:

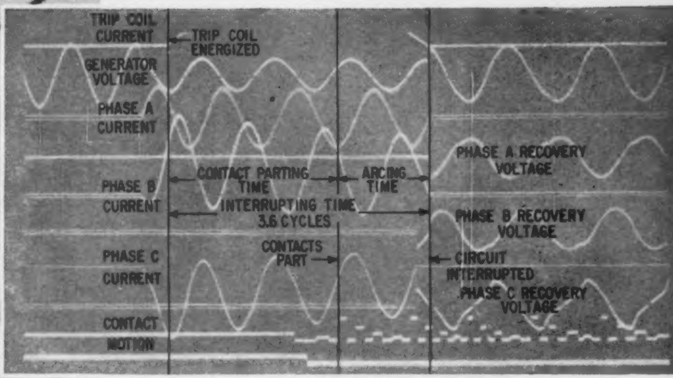
1. What is the most economical design of distribution transformers and secondaries?

2. What is the optimum combination of subtransmission and primary feeder voltages?

3. What are the optimum load-carrying capability ratings of the primary feeders and distribution substations?

Two computer programs were developed: One for transformer and secondary combinations, and the other for all system components from secondaries through the subtransmission portion of the system.

Maps of distribution voltages on the Long Island Lighting Co system in 1946 and 1959 show a distinct trend to 13 kv and away from 4-kv distribution, said F. G. Josberger. The 13-kv serves 60% of the load now on the distribution system, although only a very small area was so served in 1946. Each step toward 13 kv, Josberger said, was taken only after economic studies and careful weighing of all factors. LILCO has had a small trial installation of 23-kv distribution in service for the past 16 months.



Five-cycle performance of G-E one-tank sub-transmission breakers is demonstrated in the oscillogram above. Conventional breakers are rated to interrupt in eight cycles. Photo shows one of 17 G-E one-tank breakers installed by The Potomac Edison Company, Hagerstown, Md.

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Cut Interruption Time to Five Cycles

Five-cycle performance of General Electric's one-tank sub-transmission breakers (15 kv through 46 kv) provides superior system protection. This is a full three cycles faster than industry requirements for breakers of this class. Here's what quicker interruption means to you:

- Chances of line burn-down are reduced;
- Inspections and maintenance can be reduced, because oil carbonization and contact wear are minimized.

Five-cycle interruption is possible because of the interrupter efficiency and compactness of the G-E one-tank breaker. Since linkages are shorter and lighter, contacts part in 2½ cycles or less. Field-proven oil-blast interrupters also help decrease interrupting time.

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SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT • BUSINESS
EQUIPMENT — USED OR RESALE

OPPORTUNITIES

ADDRESS BOX NO. REPLIES TO: Box No.
Classified Adv. Div. of this publication.
Send to office nearest you.
NEW YORK 36: P. O. Box 12
CHICAGO 11: 520 N. Michigan Ave.
SAN FRANCISCO 4: 68 Post St.

POSITIONS VACANT

Wanted—Electrical Engineers. Minimum five years experience in public Utility Distribution. Transmission, Metering and Relaying. Required for permanent, responsible positions in Venezuela. Spanish an asset but not essential. Good living conditions. Starting salary of $13,000 per annum. P-3537, Electrical World.

Chief Electric Engineer in a government agency. Location New York City. Position has varied top level administrative and engineering responsibilities. Qualifications: PE License and 6 years utility experience or the equivalent. P-4111, Electrical World.

Utility Engineer/Economist—Graduate engineer with analytical experience in public utility economics, rates and regulation; for semi-senior position in consulting engineering office—location New York City. P-4251, Electrical World.

Electrical Engineers—A few openings for engineers with 5 years experience in design and construction of transmission and distribution systems normally associated with large utilities. Single men preferred but will accept married men with small families. Duration, minimum of 18 months. Salaries $12,000 and up. U. S. citizenship required. Location Middle East. Send detailed resume to Miner and Miner International, Inc., 5598 South Broadway, Littleton, Colorado.

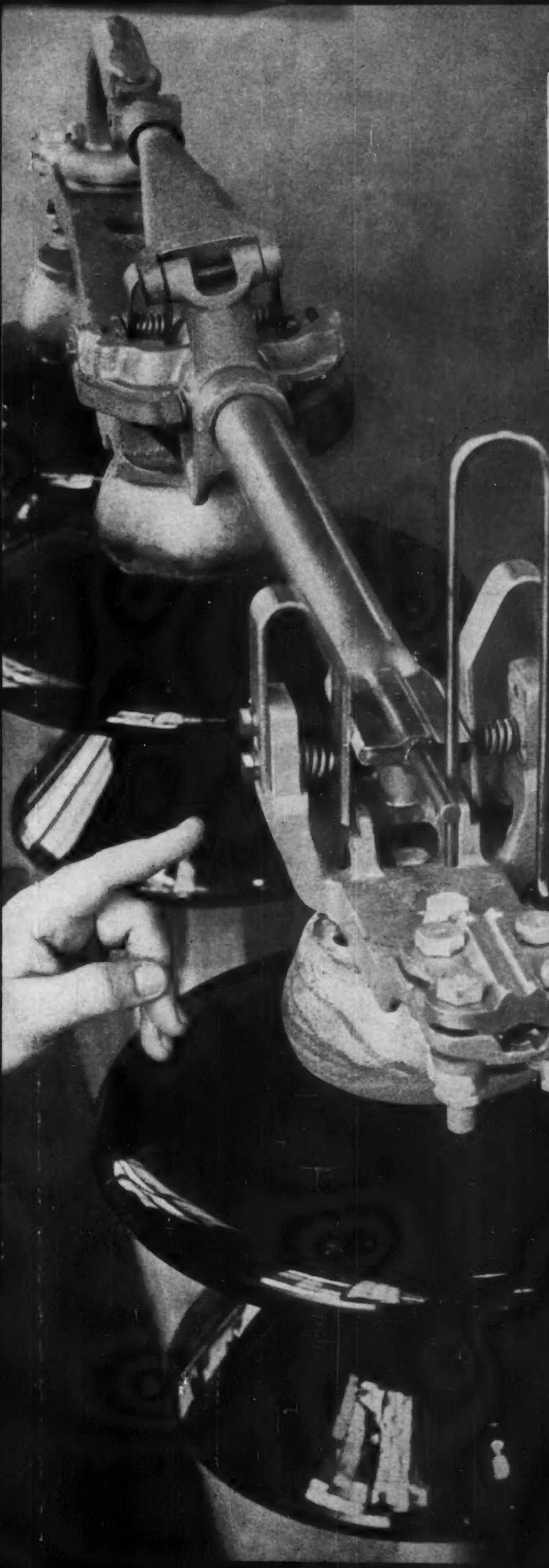
SELLING OPPORTUNITY AVAILABLE

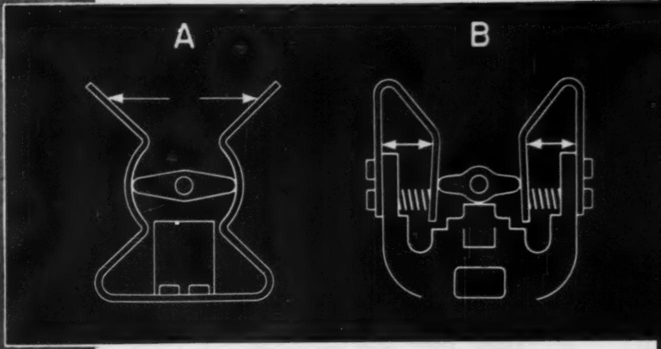
Representative wanted for manufacturer of street lighting equipment pole line specialties. Full particulars. RW-9821, Electrical World.

POSITION WANTED

Competent Manager. Engineering design and construction, standard cost control. Market studies, utility rate structure and negotiations. Industrial, government R & D Utility generation and systems. Resourceful and technically sound EE. Ten years outstanding record one employer. Age 40, $18,000. PW-4096, Electrical World.

(Additional Searchlight on page 194)





ORDINARY OPEN CONTACTS (A) are forced apart during short-circuit conditions. G-E inverted-loop contacts (B) actually increase their grip during short-circuit stresses to help assure continuous, reliable performance.

GENERAL ELECTRIC RF-2 DISCONNECT SWITCHES PROVIDE . . .

Positive Operation During High Short-Circuit Stresses

Inverted-loop contacts with insulated stainless-steel back-up springs put the squeeze on the blade of a General Electric RF-2 disconnect switch. As a result, the blade stays firmly in contact even under high short-circuit stresses to help assure continuous, reliable service.

When the blade is closed, current flows up and around the stationary contacts, causing them to put added line contact pressure on the blade. This squeezing pressure actually increases during momentary flow. In short-circuit tests, the switch blade stayed in position without distortion or pitting of contacts.

Other features which contribute to the continuous, reliable performance of General Electric disconnect switches include:

- **Rotating Rear Insulator** which rotates the switch blade into and out of contact for ice-breaking action;
- **Arcing Horn** which diverts current away from contacts during opening and closing to help eliminate contact pitting and erosion.
- **Minimum Number of Current Transfer Points** to reduce heat losses, increase switch life, and reduce maintenance.

For more information, contact your General Electric Apparatus Sales Engineer. Or write to Section 495–07, General Electric Co., Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

TRANSFORMERS

3—2500 KVA G-E 69000—2400/4160Y
3—2500 KVA G-E 69000—7200/12470Y
4—2500 KVA W-H 34500—2400/4800
3—1500 KVA G-E 69000—24/4160Y
3—1500 KVA G-E 69000—7200/12470Y
4—1000 KVA Mol 7200/12470Y—4160
3— 500 KVA G-E 22000—2300/4000Y
3— 500 KVA Penn. 13200—120/240
3— 333 KVA G-E 66000—2400/4160Y
3— 333 KVA Wag. 2400—120/240
1—750/938 KVA G-E 3-Ph. 3300—6900Y—TCUL equip. fan cooling
1—1000 KVA W-H 3-Ph. 33000—7200Y TCUL equipped

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
5316 Hetzel St.
Cincinnati 27, Ohio

47 Years' Dependable Service

2500 KVA GENERAL ELECTRIC MASTER UNIT SUB STATION

Still in Original Crates

Outdoor Type 3/60/13,800 V Primary, 2400 V Secondary

Assembled in 3 sections as follows:

A. Incoming Line Section
  1—cable selector switch
  2—13,800V—35 AMCM cable
  1—Auto blast interrupter switch type SE-5 with key lock coordinated with transformer secondary breaker

B. Transformer Section
  1—2500 KVA 3/60/13,800V Liquid filled, with Manual Tap Charger

C. Outgoing Section
  1—Control Panel & 10 KVA single phase 60 Cy. 2400/240/120V transformers for electric heaters & lights 4—Type AM 4.16.50 1200A Magnablast Air Circuit Breakers, Control panel contains 3 current transformers, ammeter and ammeter selector switch.

Cost $47,000.00

JOYCE EQUIPMENT CO., INC.
406-12 Ward Street Chester, Pa.
PHONE: TRemont 4-8496

OFFICIAL PROPOSALS

Bids: May 16, 1960

Tenders For Supply of Equipment

Tenders are invited for the supply of all or any of the following items of equipment:—
- TRANSFORMERS
- METERS
- METERING EQUIPMENT
- HOUSE SERVICE DISTRIBUTION BOARDS
- UNDERGROUND CABLES AND ACCESSORIES

Specifications may be obtained on writing to the purchasing Officer, Trinidad and Tobago Electricity Commission, P.O. Box 121, Port-of-Spain, Trinidad, W.I. Closing date for Tenders 16th May, 1960.

DON'T FORGET

the box number when answering advertisements. It is the only way we can identify the advertiser to whom you are writing.

SYNCHRONOUS MOTORS WANTED

One (1) 1750 to 2000 HP double or single-ended shaft, 720 RPM unity power factor snychronous motor, arranged for operation on 13,800 Volt, 3 Phrase, 60 Cycle AC service, complete with one (1) set of magnetic reduced voltage starting equipment with accessories and with an interrupting capacity of 150,000 to 250,000 KVA.

One (1) 2500-3000 HP double ended shaft, 720 RPM unity power factor synchronous motor arranged for operation on 13,800 Volt, 3 Phrase, 60 Cycle AC service, complete with one (1) set of magnetic reduced voltage starting equipment with accessories and with an interrupting capacity of 250,000 to 350,000 KVA.

WRITE Harvey Aluminum, Attn: Don Sherbon, 19200 S. Western Avenue, Torrance, California.

SUBSTATION EQUIPMENT

TRANSFORMERS

QU.	KVA	MFR.	VOLTAGE
1	12000	G.E.	115,000—46,000 L.T.C.
1	5000	West.	115,000—13,750, 3 Ph.
1	10000	West.	67,000—34,500, 3 Ph. Auto.
1	3750	G.E.	69,300—13,200, 3 Ph.
1	3000	G.E.	69,000—4340, 3 Ph.
3	500	G.E.	66,000/33,000—2300/13200
1	2500	Mol.	44,000—2400/4160, 3 Ph.
2	2500	Wagner	45,800/22,900—4160Y, 3 Ph.
3	200	West.	44,000—480
1	5000	West.	34,500—13750/6875, 3 Ph.
1	4500	West.	33,000—2500/4330, 3 Ph.
2	3000	Upgf.	34,750—4160, 3 Ph.
1	2000	Kuhl.	34,650—440, 3 Ph.
2	1500	G.E.	34,400—2520, 3 Ph.
3	1250	A.C.	33,000—480
3	500	Mol.	34,500—2300/4600
3	200	A.C.	34,500—2400/7200/12470Y
3	200	Wagner	34,500—240
2	3000	G.E.	26,400—4160Y/2400, 3 Ph.
3	833	A.C.	26,400—480
2	3000	G.E.	13,800—2640, 3 Ph.
1	2500	G.E.	13,800—2400, Unit Sub.
1	600	Stand.	13,200—2300, 3 Ph.
1	450	Penna.	13,200—2400, 3 Ph. Askarel
1	450	Penna.	13,200—2400, 3 Ph. Askarel
3	333	G.E.	13,200/22,800Y—2420/4190Y
3	100	G.E.	7,200—240/480
3	100	A.C.	6,900—2400
1	500	Kuhl.	4,800—480, 3 Ph.
3	100	G.E.	4,800—120/240
1	1000	A.C.	2,400/4,160—240, 3 Ph.
3	400	G.E.	2,300/4,000—230/460
FEEDER REGULATORS, 3 PH.—OUTDOOR			
1	750	G.E.	13,200 V. 360 A. STEP
1	500	G.E.	4,160 V. 694 A. STEP
1	375	G.E.	34,500 V. 502 A. STEP
1	300	G.E.	6,600 V. 262 A. STEP
1	250	A.C.	2,400 V. 601 A. STEP

Also: FREQUENCY CHANGERS, M-G SETS, SWITCHGEAR and CIRCUIT BREAKERS, ETC.

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& COMPANY, INC.
52 CHURCH ST., NEW YORK 7, N. Y.

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Prompt Stock Shipment
RENUBILT MOTORS - GENERATORS
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BELYEA COMPANY, INC.
51 Hewell St. Jersey City, N. J.
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Electrical Equipment Representatives

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C. W. SWARD, Executive Director EERA
1675 Fifth St. Clermont, Florida

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Relocation allowances cover moving costs plus transportation reimbursement for you and members of your family. If you have an interest in a San Francisco assignment, please send a resume of experience to George I. Copeland, Manager of Personnel. Personal interviews will be arranged for qualified candidates.

Bechtel
Corporation
220 Montgomery Street
SAN FRANCISCO

In New York City, a personal interview can be arranged by phoning Paul Keating, MUrray Hill 7-7100.

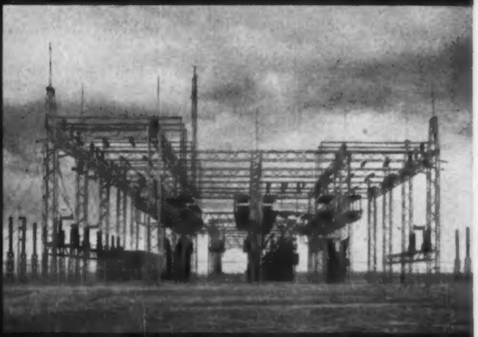
Career Position plus Management Opportunity

Heavy sales-engineering contacts with industrial power customers of large, progressive midwest electric utility. Need two alert, ambitious, aggressive producers to strengthen middle management staff. Excellent opportunity to grow and advance.

EE's with utility or plant electrical engineering experience preferred but will consider all otherwise qualified applicants. Send resume of personal background, education, job experience, salary requirements and photo. Replies held in strict confidence.

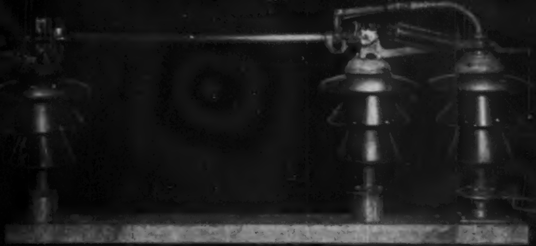
BOX P-4212
520 N. Michigan Ave., Chicago 11, Ill.

Single column of Type ATB air-blast power circuit breakers—115-460 kv.

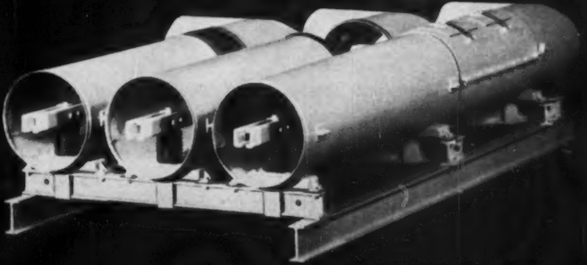


Completely designed and coordinated outdoor stations—7.5-230 kv.

Single-tank sub-transmission breakers—14.4-46 kv.



Disconnect switches—7.5-345 kv.



Isolated phase bus—14.4-34.5 kv, through 20,000 amps.

GENERAL ELECTRIC OFFERS YOU A COMPLETE LINE OF HIGH-VOLTAGE SWITCHGEAR . . . . .

Why Settle for Less?

When you buy General Electric generation and transmission switchgear, you get one all-important benefit no other manufacturer can match—*outstanding added value.*

You Get Top Product Design—From giant 460-kv air-blast breakers to custom-tailored outdoor stations, General Electric high-voltage switchgear equipment is designed for easiest installation, top safety, optimum performance, and dollar-saving ease of maintenance.

You Get Results of Research—Important General Electric developments in the high-voltage switchgear field include:

- First single-tank, five-cycle outdoor sub-transmission breaker;
- First modern air-blast transmission breaker;
- First isolated-phase bus with conductors having a 105°C maximum hot-spot temperature.
- First computer-designed outdoor station.

You Get Nation-wide Service—G-E sales offices and service centers throughout the nation assure you of prompt, courteous application and installation assistance; also, fast, high-quality maintenance and repair service.

Why Settle for Less? Whether you want one disconnect switch, or a complete, custom-tailored switching station, with General Electric you get the *best* in switchgear. For information on specific equipments, contact your G-E sales engineer. Or send in the coupon below.

Progress Is Our Most Important Product

GENERAL ELECTRIC

General Electric Co.
Section A492-13
Schenectady 5, N. Y.

Send me detailed information on the following:

- ☐ High-voltage air-blast breakers
- ☐ Disconnect switches
- ☐ One-tank sub-transmission breakers
- ☐ Isolated phase bus
- ☐ Outdoor stations 7.5 to 345 kv

OTHER: ____________________

NAME ____________________ TITLE ____________

COMPANY ____________________

ADDRESS ____________________

CITY ____________________ STATE ____________

The Meetings Calendar

MAY

National Association of Electrical Distributors—52nd Annual Convention, Dallas, May 1-4.

Electrochemical Society—Spring Meeting, La Salle Hotel, Chicago, May 1-5.

Instrument Society of America — Symposium on Electrical Safety Instrumentation, DuPont Country Club, Wilmington, Del., May 2-3; National Power Instrumentation Symposium, Brooks Hall, San Francisco, Calif., May 9-11.

Pennsylvania Electric Association—System Planning Committee, Skytop, May 2-3; Electrical Equipment Committee, Skytop, May 5-6; Industrial Sales Conference, Skytop Club, Skytop, Pa., May 12-13; Joint Structures & Hydraulics & Prime Movers Committees, Dimeling Hotel, Clearfield, May 16-17; Relay Committee, Fort Stanwix Hotel, Johnstown, May 19-20; Transmission & Distribution Committees, Berkshire Hotel, Reading, May 19-20.

Edison Electric Institute—Purchasing & Stores Committee, Warwick Hotel, Philadelphia, May 2-4; Second Financial Conference, La Salle Hotel, Chicago, May 9-11; Commercial Cooking Conference, Sheraton Towers Hotel, Chicago, May 10; Meter & Service Committee, Hotel Lorraine, Madison, Wis., May 22-25; Transmission & Distribution Committee, Penn Sheraton Hotel, Pittsburgh, May 12-13; Electrical System and Equipment Committee, Baker Hotel, Dallas, May 16-17.

American Institute of Electrical Engineers—Northeastern District Meeting, Providence, R. I., May 2-4; Spring Textile Meeting, Georgia Institute of Technology, Atlanta, May 5-6; Farm Electrification Conference, Sheraton-Fontenelle Hotel, Omaha, May 10-12; Appliance Technical Meeting, Leland Hotel, Mansfield, Ohio, May 16-17; Electrical Problems in the Cement Industry, Pfister Hotel, Milwaukee, May 17-19.

Western Joint Computer Conference—San Francisco, May 2-6.

• **American Public Power Association** — Annual Meeting, Shoreham Hotel, Washington, D. C., May 3-5.

• **Illuminating Engineering Society**—South Pacific Coast Regional Conference, Ambassador Hotel, Los Angeles, May 4-6; Pacific Northwest Regional Conference, Benjamin Franklin Hotel, Seattle, May 9-10; Midwestern Regional Conference, Sheraton Martin Hotel, Sioux City, Iowa, May 12-13; Great Lakes Regional Conference, Carter Hotel, Cleveland, May 16-17.

• **Conference for Protective Relay Engineers**—Illinois Institute of Technology, May 5-6.

• **1960 Protective Relaying Conference**—Georgia Institute of Technology, Atlanta, May 5-6.

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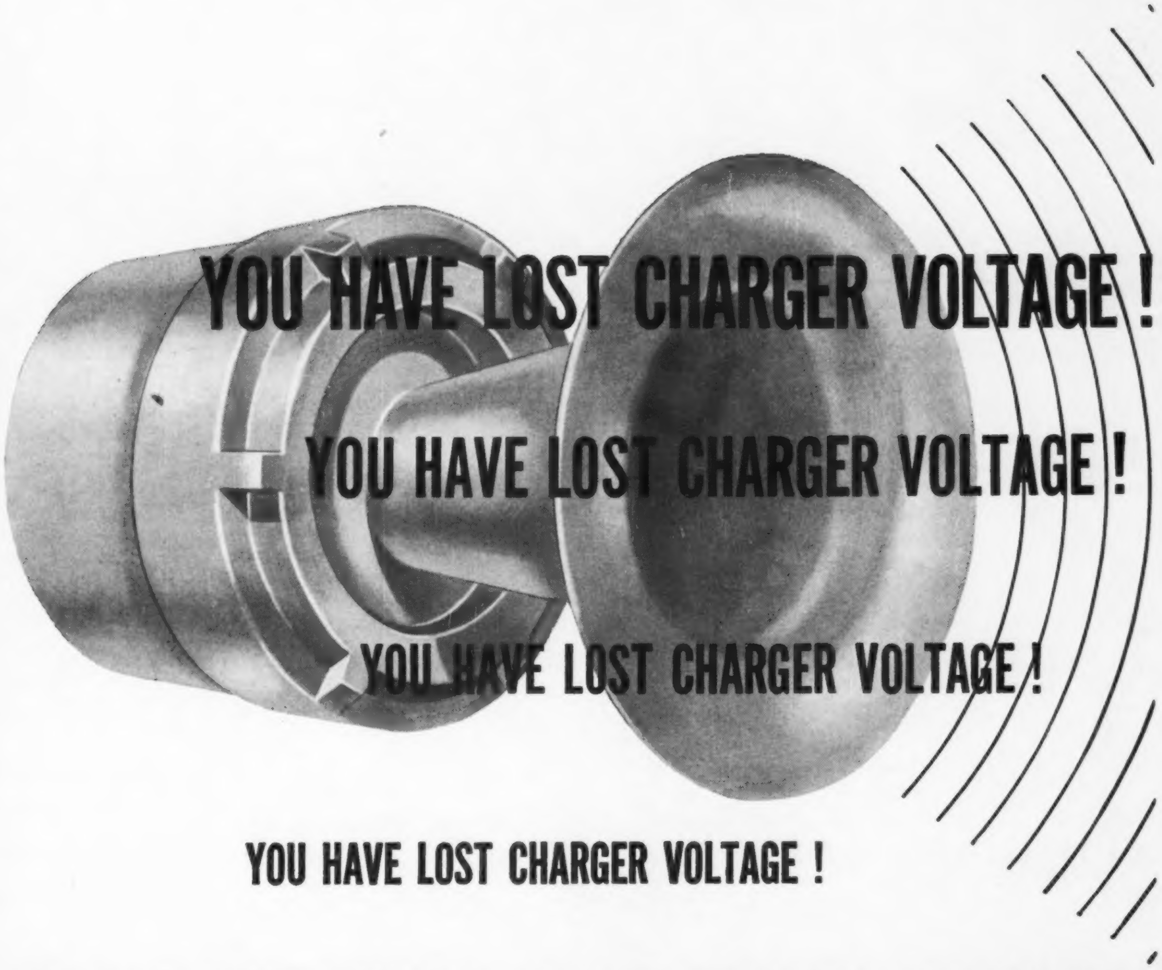
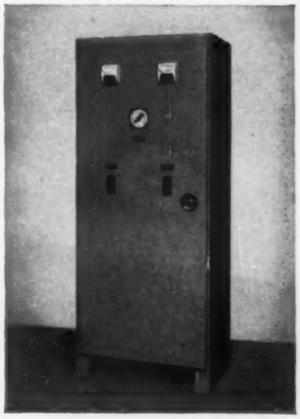

YOU HAVE LOST CHARGER VOLTAGE !
YOU HAVE LOST CHARGER VOLTAGE !
YOU HAVE LOST CHARGER VOLTAGE !
YOU HAVE LOST CHARGER VOLTAGE !

NEW EXIDE SILICON CHARGERS AVAILABLE WITH CHOICE OF ACCESSORIES TO GIVE YOU INSTANT WARNING OF TROUBLE ON CHARGER CIRCUITS



A-C failure alarm. A simple detection system that actuates a relay if charger loses a-c power. Two sets of contacts. Can be connected to blow horn, turn off remote pilot lamp, or operate other signaling device.

No-charge alarm. Will detect practically any trouble that would interfere with charging current: loss of a-c power, blown a-c fuse, open a-c switch, blown d-c fuse, etc. Can operate any audible or visual alarm device.

Ground detection system. Indicates if either negative or positive line to battery becomes grounded. Choice of three arrangements: voltmeter with switch, local pilot lamps, and remote audible or visual alarm device.

Low voltage alarm. Signals when battery voltage drops below pre-selected value after loss of a-c. Actuates horn or pilot lamp. Alarm turns off when a-c is restored and battery voltage reaches 3 volts over drop-out setting.

These accessories are all available on any one of the 32 sizes of Exide Model UR silicon chargers for stationary batteries. Write for details and schematic diagrams. Exide Industrial Division, The Electric Storage Battery Company, Phila. 20, Pa.

Exide®

the
KUHLMAN
60
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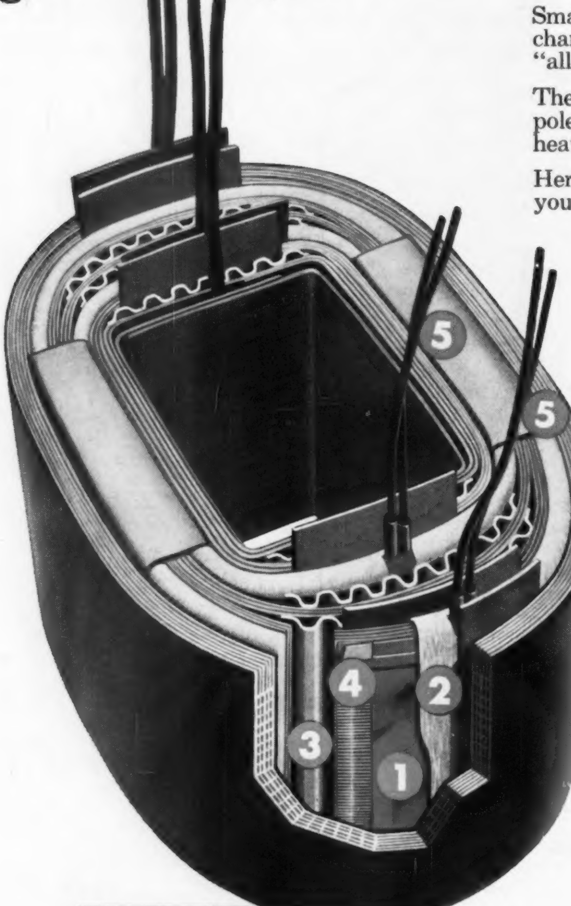
NEW KUHLMAN COIL INCREASES MARGIN OF SAFETY—CUTS TRANSFORMER WEIGHT AND SIZE



Smaller—lighter—improved impulse voltage distribution characteristics—these are the outstanding features of the "all new" Kuhlman '60 transformer.

The new design puts more transformer per pound on the pole, with the same low losses and high performance of heavier units.

Here's how Kuhlman's new coil design eliminates weight you no longer need:

1 *Equalized voltage stress.* A newly developed equalizing shield protects the winding from sudden surges. Voltage stresses are equally distributed so that no portion of the winding is subjected to the full strength of a surge. Result: A more compact coil with improved impulse voltage distribution characteristics, higher margin of safety.

2 *Improved space factor.* In addition to shielding, special insulation is used to provide puncture as well as creep values. The use of puncture insulation permits a more compact coil with better impulse voltage distribution characteristics.

3 *Planned cooling.* Coil compactness is balanced with ample cooling. Generous ducts are placed in the windings to provide rapid heat transfer and low temperature gradient, thus giving rise to longer transformer life.

4 *Greater mechanical strength.* Insulation crimping at the end of each layer of windings has been lengthened to increase mechanical support. This added support makes a mechanically stronger coil.

5 *All crossing of primary leads is eliminated.* Start and finish leads come out at opposite ends of the windings.

This use of better and more costly materials results in a smaller core and coil, a smaller tank and a general all-over reduction in weight and size.

So why put weight on the pole you don't need? Install the "all new" lighter, more compact Kuhlman '60.

KUHLMAN TRANSFORMERS

KUHLMAN ELECTRIC COMPANY, Birmingham, Mich.
Manufacturers of transformers since 1894
FACTORIES: Bay City, Mich. • Crystal Springs, Miss. • Salinas, Calif.